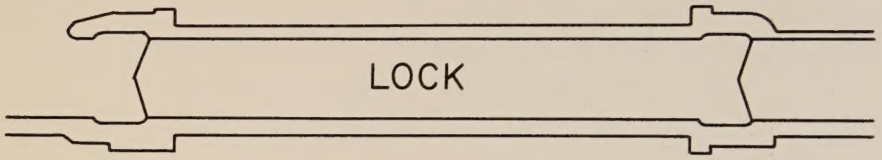
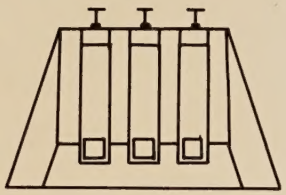
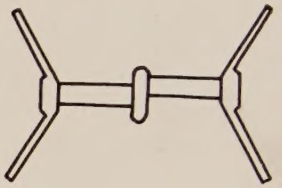
J.J. MURPHY

STRUCTURE CONDITION REPORT

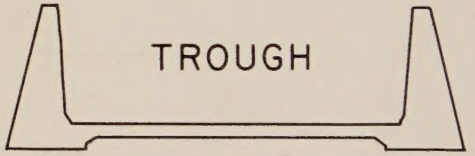




WASTE GATE



GUARD GATE



BARGE CANAL

FAIRPORT-LOCK 33

MATERIALS BUREAU

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

STRUCTURE CONDITION REPORT

BARGE CANAL - WESTERN SECTION

FAIRPORT TO LOCK 33

P.I.N. 4940.29 - 101

MATERIALS BUREAU

ALBANY NEW YORK

AUGUST 1975

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NEW YORK STATE
DEPARTMENT OF TRANSPORTATION
Raymond T. Schuler, Commissioner

1220 Washington Avenue, State Campus, Albany, New York 12226

August 1, 1975

Mr. George M. Briggs, Director
Transportation Maintenance Division
NYS Department of Transportation
1220 Washington Avenue
Albany, New York 12232

Dear Mr. Briggs:

Transmittal of Structure Condition Report
Barge Canal - Fairport to Lock 33
PIN 4940.29-101

In accordance with your request of December 16, 1974, this Bureau has evaluated the condition of the portland cement concrete in the structures located on the Barge Canal between Fairport and Lock 33. This evaluation was conducted utilizing the following techniques:

Core samples were obtained and analyzed from areas of each structure.

Compressive strengths were obtained from selected cores.

Each structure was sounded to determine both the presence of delaminated concrete and to supplement the information obtained from the cores.

The overall surface condition of the concrete in each structure was visually inspected and photographed.

The conclusions and recommendations included in this report result from the summary of the information obtained from these evaluation techniques coupled with the intended function of each structural component. The evaluation of the Bushnell Basin Trough Floor, the Irondequoit Trough Floor and the culverts passing under this section of the canal remain to be completed. These will be included in a separate report which will be forwarded to you in the near future.

Bureau personnel participating in this evaluation include: S. J. Candib, D. M. Sweredoski, C. G. Holub, J. J. DiFabio, W. L. Robson, D. Jarose, and W. A. Snyder. J. J. Murphy and T. E. Wohlscheid coordinated the evaluation for the Bureau. Formal acknowledgement of the assistance and cooperation received from the following Region 4 personnel is herein noted: C. K. Burkwit, Regional Waterways Maintenance Engineer, and his entire staff, T. J. Mahaney, Technical Services Engineer, C. R. DiCenzo, Materials Engineer; with special thanks extended to K. Hunt for his assistance during the coring operations.

This report details the condition of the concrete in the structures for the subject canal area and should be used in conjunction with reports from other involved Bureaus and Subdivisions in evaluating the overall canal condition. If any questions arise concerning this report, please contact this Bureau. A similar evaluation is presently being conducted on the structures in the canal section between Lock 33 and Lockport. This report is anticipated to be completed during 1976.

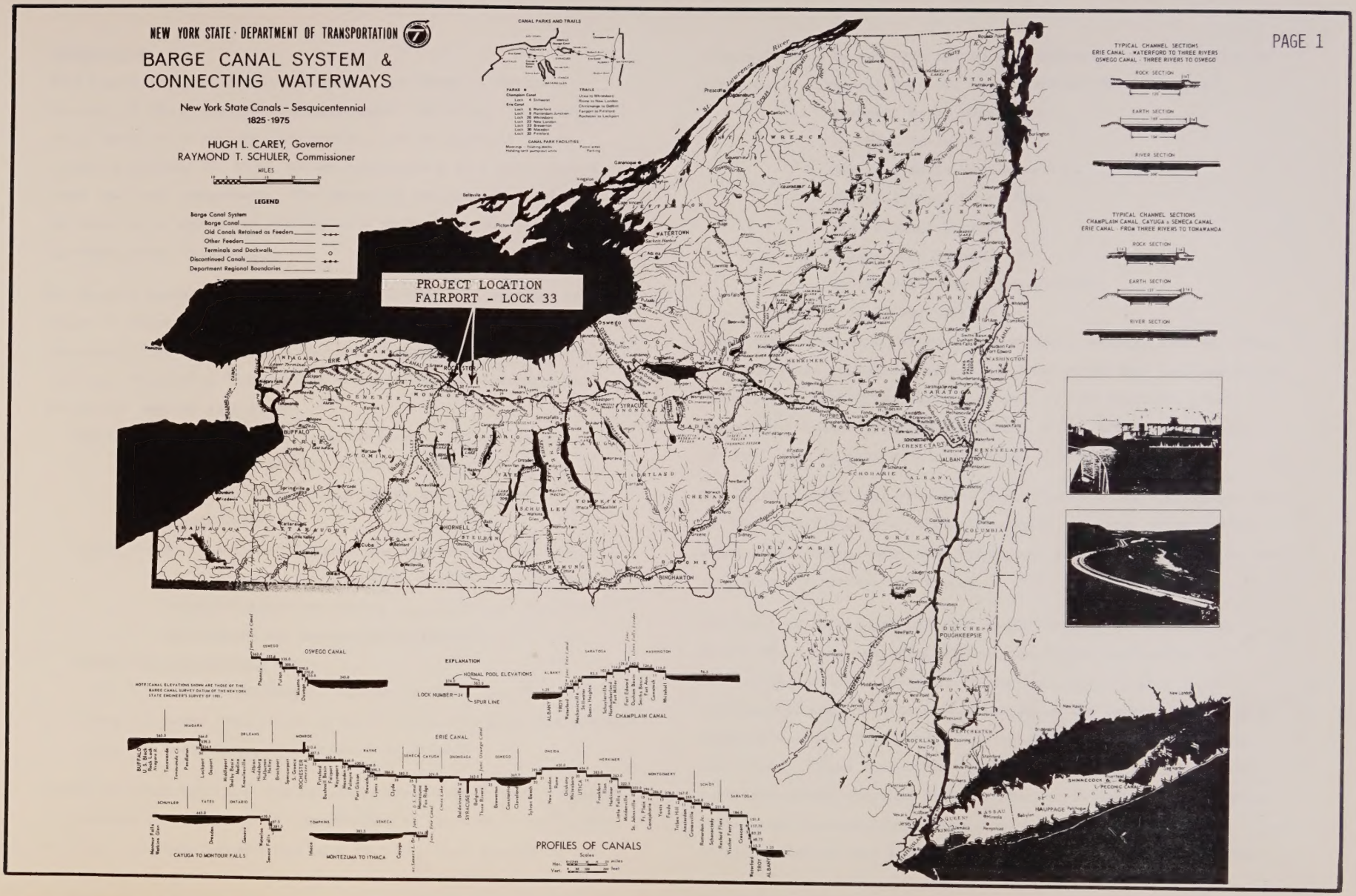
Very truly yours,

HARRY H. McLEAN
Director, Engineering Materials

By
Thomas E. Wohlscheid
THOMAS E. WOHLSCHEID P.E.
Associate Civil Engineer, Materials

Enclosure

TEW/ARS


NEW YORK STATE · DEPARTMENT OF TRANSPORTATION
BARGE CANAL SYSTEM & CONNECTING WATERWAYS
New York State Canals – Sesquicentennial
1825-1975
HUGH L. CAREY, Governor
RAYMOND T. SCHULER, Commissioner
MILES
LEGEND
Barge Canal System
Barge Canal
Old Canals Retained as Feeders
Other Feeders
Terminals and Dockwalls
Discontinued Canals
Department Regional Boundaries
CANAL PARKS AND TRAILS
PARKS
Champlain Canal
Erie Canal
TRAILS
CANAL PARK FACILITIES
PROJECT LOCATION
FAIRPORT - LOCK 33
TYPICAL CHANNEL SECTIONS
ERIE CANAL - WATERFORD TO THREE RIVERS
OSWEGO CANAL - THREE RIVERS TO OSWEGO
ROCK SECTION
EARTH SECTION
RIVER SECTION
TYPICAL CHANNEL SECTIONS
CHAMPLAIN CANAL, CAYUGA & SENECA CANAL
ERIE CANAL - FROM THREE RIVERS TO TONAWANDA
ROCK SECTION
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EXPLANATION
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SPUR LINE
CHAMPLAIN CANAL
ERIE CANAL
CAYUGA TO MONTOUR FALLS
MONTEZUMA TO ITHACA
PROFILES OF CANALS
Scales
Hor.
Vert.
Miles
feet

INTRODUCTION

This report was prepared at the request of George M. Briggs, Director of the Transportation Maintenance Division. The request was a result of a failure that occurred in the Bushnell Basin Trough on October 29, 1974, during construction of a sewer tunnel under the canal embankment. The tunneling operation was being performed by a contractor working on a project for the Irondequoit Bay Pure Waters District.

Mr. Brigg's request was translated into a work plan prepared by Lyndon H. Moore, Director of the Soil Mechanics Bureau and Project Coordinator for the Technical Services Subdivision. Mr. Moore's work plan included a "Purpose," a "Scope," and an "Investigation Schedule," defined as follows:

"PURPOSE - To develop long range monitoring and maintenance programs to provide continuous and efficient operation of the canal system and to insure public safety."

"SCOPE - To inspect and document the condition of the present canal system; to evaluate the condition and prepare recommendations for future corrective and preventive maintenance and monitoring programs."

"INVESTIGATION SCHEDULE -

Area 1 - Irondequoit Basin - Fairport to Lock 33 - 9 miles

Area 2 - Wayne County Line to North Gates - 23 miles minus Area 1

Area 3 - North Gates to Lockport - 40 miles."

Under the scope outlined, the Materials Bureau staff began a program to evaluate the condition of the concrete in the structures located in Area 1 between Fairport and Lock 33. The first portion of the evaluation was to identify the major structures in this section of the canal. From east to west, these concrete structures are:

Bushnell Basin Guard Gate

Bushnell Basin Trough

Bushnell Basin Retaining Wall

Bushnell Basin Waste Gate

Sloped Canal Lining

Irondequoit Trough

Cartersville Guard Gate Complex

Lock 32 and Lock 33

These structures were originally constructed between 1910 and 1918. Over the years, numerous repairs to these structures were completed by both Waterways Maintenance personnel and by Contract. Each structure, whether previously repaired or the original concrete, was evaluated to determine its present condition.

The evaluation of each structure consisted of a thorough inspection of the overall concrete surface condition. A total of 88 representative core samples were taken from areas of the structure which were indicative of typical conditions.

The required core depth to reach sound concrete was determined during the coring operation through the visual examination of each extracted core. When the field crew believed that sound concrete was reached, the coring operation was terminated for that particular core. Each core was later inspected in detail in the laboratory. These inspections revealed that a few of the cores contained minute fracture planes at the depth previously determined to be sound concrete by the field crew. These minute fracture planes indicated that isolated delaminations still existed in the

concrete structure at the lower depth of the core. Minute fracture planes in a core are an indication of the beginning of concrete deterioration. The required depth to reach sound concrete is necessary for the estimation of repair quantities. Concrete for structural repair should be bonded to sound concrete in order to insure a permanent repair. Wherever possible, additional longer cores were obtained from these areas. If additional cores were not obtained, the depth to reach sound concrete was estimated based on the condition of the concrete in the lower portion of the core.

The cores submitted for compressive strength testing are representative of the sound concrete in the structure from which the core was obtained. Severely fractured or deteriorated portions of the core were removed prior to compressive strength testing. Some of the tested cores did contain minute fracture planes, which did not appreciably affect the compressive strength results.

Soundings of each structure were used to both supplement the information obtained from the cores and to detect the presence of delaminations. Generally, soundings were only obtained along the lower 6 feet of the concrete or wherever one could walk. These soundings were interpreted, through visual observation and cores, into an overall condition of the concrete in any one area.

The intended function of each structure on this section of the Canal was also investigated and related both to the safety of the public and to the operation of the Canal. Locks serve the purpose of permitting boats to travel the Canal system. The condition of the concrete in the two locks on this section of the Canal has little effect on the safety of the public but, of course, does effect the operation of the Canal. The function of the sloped Canal lining is to prevent water erosion of the embankment, which serves to contain the Canal and control seepage of water. Guard gates can be lowered to prevent the flow of water should a breach in the Canal occur. The condition of the concrete in the guard gates, retaining walls, trough sections and waste gates has an effect on both public safety and the operation of the Canal.

A glossary of the technical terms as used in this report is included to assist the reader.

GENERAL CONCLUSIONS

The majority of the concrete in the nine structures located between Fairport and Lock 33 is in good condition.

The evaluation revealed that most of the concrete deterioration present on these nine structures is surface related. All surface related deterioration has no detrimental effect on the safety of the public or the operation of the Canal. However, this surface deterioration does effect the esthetics of the structure.

Portions of the guard gates and locks in this Canal section contain isolated areas of deep deterioration. This deterioration is not extensive and does not effect the safety or operation of the structure at the present time. However, future repairs are required. The specific structures and locations of this deterioration are included in the report sections describing each separate structure.

Concrete deterioration in only one structure, the Cartersville Waste Gate, has progressed to the point where immediate repairs

were considered necessary. As a result of our evaluation and the Structures Subdivision's evaluation of the structural stability of this gate, repairs will be completed prior to the reopening of this canal section. Repairs include replacing the two concrete compression buttress walls which provide support for the main gate wall. This repair work has been added to Contract M75-2, presently underway for repair of the breach in the Bushnell Basin Trough.

This evaluation summarizes the present condition of the concrete in these nine structures after over 60 years of service and exposure to weathering. The recommendations and conclusions cover both immediate and future canal repair needs to insure continued efficient and safe operations. These recommendations and conclusions have resulted from the concrete condition evaluation and the intended function of each structure.

In order to retard future concrete deterioration and to improve appearance, it is desirable to completely restore each structure. However, compliance only with our recommendations will not satisfy this goal. Therefore, we recommend that a comprehensive, long range program be formulated to restore each structure. Structure restoration should be performed on a priority system considering first, the condition of the structure and its effect on public safety, and second, the effect of the structure on the operation of the canal system.

GLOSSARY OF TECHNICAL TERMS

(as used in this report)

ABUTMENT - a concrete wall which acts as a retaining wall and supports the end of an overhead structure.

AGGREGATE - sand and stone of various sizes used with water and cement to form concrete.

BUFFER BEAM - a steel beam that can be swung out from the upper and lower guide walls. Its purpose was to prevent barges from accidently ramming the closed lock gates. They are no longer used.

BUTTRESS - a smaller vertical wall generally projecting at a right angle from another larger wall, to help prevent the larger wall from overturning.

COLD JOINT - an unintentional joint in concrete caused when a fresh layer of plastic concrete is placed upon a layer of concrete which has partially or completely set (hardened).

COMPRESSIVE STRENGTH - a term used to indicate the strength of concrete, designated as pounds per square inch (p.s.i.). It is calculated by dividing the applied load at fracture by the cross sectional area.

CONSTRUCTION JOINT - an intentional joint in concrete caused when a fresh layer of plastic concrete is abutted to a layer of hardened concrete. The function of a construction joint is to allow differential movement without damaging structural integrity.

CORE - a cylindrical sample of concrete (usually 4 inches in diameter) obtained by drilling with a thin walled tube.

DELAMINATION - cracking or fracturing of concrete under and in a direction parallel to its surface.

DETERIORATION - a condition of portland cement concrete which implies distress in the form of scaling, delamination, cracking, or efflorescence.

EFFLORESCENCE - a whitish, crystalline deposit on the surface of concrete caused by the evaporation of mineral bearing water as it exits from cracks in concrete.

EMBANKMENT - a bank of earth used to confine the canal above the level of the natural landscape.

FOOTING - a concrete substructure located at the bottom of a wall, pier, or column which distributes the weight and load downward into the underlying soil.

FRACTURE PLANE - an area of weakness in a concrete structure which may be evidenced either by a hollow, dull sound when the concrete is struck with a hammer, or by a crack in a core sample.

FREEZE-THAW CYCLE - cycles of alternate freezing and thawing resulting from weather conditions. It is usually associated with distress in the concrete caused by the expansive forces of freezing water.

GATE WALL - that part of the waste gate which acts as a thin walled dam.

GRAVITY WALL - a concrete retaining wall designed to be stable by virtue of its shape and weight.

GUIDE WALL - the walls at the upper and lower ends of the lock where boats are guided into the lock chamber.

INTENTIONAL BREAK - damage done to a core while removing it from the core hole during the coring operation. The core barrels are only capable of drilling a 12 inch long section at one time. After this first section is broken off and removed, the next 12 inch section can be drilled.

PIER - a concrete support used to hold up the center sections of a bridge or gate between the abutments.

PILE - wooden shafts driven into the earth to carry or transfer structure loads to the soil or to underlying rock.

RETAINING WALL - a structure designed to hold back a mass of earth.

SCALING - progressive disintegration of concrete surfaces resulting from expansive pressures generated by freezing of water.

SHEET PILE - wooden planks or steel sheets driven into the earth and used to control the underground flow of water and fine grained soils. Also referred to as sheeting.

SHOTCRETE - mortar or concrete conveyed through a hose and pneumatically projected at high velocity onto a surface. Shotcrete has been used for the repair of deteriorated surfaces in the canal.

SILL - a concrete slab which supports the bottom of a guard or lock gate.

SODA STRAW - a thin walled, hollow deposit of calcium carbonate and other minerals, hanging vertically from a concrete surface, that has the appearance of a soda straw.

SOUND CONCRETE - concrete which has acceptable compressive strength, durability and quality. Sound concrete does not contain fracture planes, delaminations or other forms of deterioration.

SOUNDING - a method used to determine delaminated concrete by striking the surface with a hammer. Delaminated concrete has a dull or hollow sound while good concrete has a clear ringing sound.

SPLAY WALL - an extension of the ends of an abutment or retaining wall that angles into the embankment to hold the earth in place. Also called wingwall.

STOP LOG COLUMN - slotted columns in front of the waste gate. In the event that an open sluice gate malfunctions, short sections of wood planks can be placed into the slots to stop the flow of water.

SUBSTRUCTURE - the concrete foundation (piers, columns, abutments, etc.) which supports the remainder of the structure.

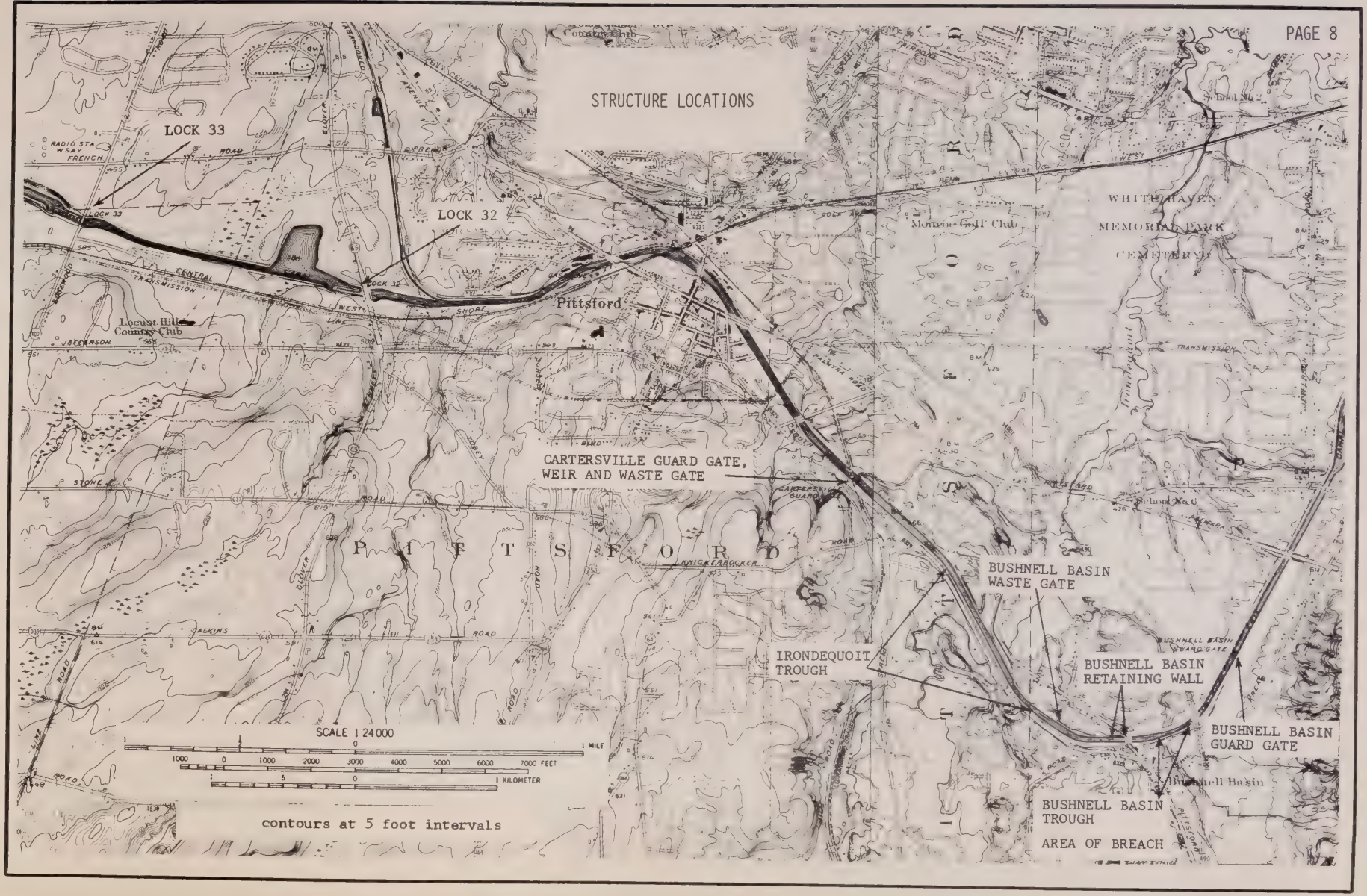
SURFACE DETERIORATION - deterioration that exists from 1 to 3 inches in depth into the structure, normally in the form of scaling or delamination.

TAILRACE - the downstream end of a dam or weir where the energy from the falling water is dissipated.

TOW PATH - narrow dirt road that runs along the edge of the canal. Originally, this road was used to tow the barges on the old Erie Canal. Presently, it serves as a maintenance and recreation road.

TYPICAL CONDITION - that condition which is representative and prevalent over the majority of the structure or substructure.

WEATHERING - the phenomenon which causes concrete disintegration resulting from exposure to the atmospheric elements over a long period of time.


STRUCTURE LOCATIONS
LOCK 33
LOCK 32
Pittsford
CARTERSVILLE GUARD GATE, WEIR AND WASTE GATE
BUSHNELL BASIN WASTE GATE
IRONDEQUOIT TROUGH
BUSHNELL BASIN RETAINING WALL
BUSHNELL BASIN GUARD GATE
BUSHNELL BASIN TROUGH
AREA OF BREACH
WHITE HAVEN MEMORIAL PARK CEMETERY
Monroe Golf Club
Locust Hill Country Club
SCALE 1:24000
1 MILE
7000 FEET
1 KILOMETER
contours at 5 foot intervals

BUSHNELL BASIN GUARD GATE

The Bushnell Basin Guard Gate is located in the Town of Perinton between the Village of Fairport and the Bushnell Basin Trough. The guard gate can be lowered to prevent the flow of water should a breach of the canal occur between this gate and the Cartersville Guard Gate to the west, or Lock 30 at Macedon to the east. Normally in a raised position, the two counterweighted steel gates, 55 feet wide and 14 feet high can be lowered by gravity and raised either manually or by electric motors.

The distance between the north and south abutments is 119 feet. The center pier of this structure is 9 feet wide and 37 feet long. The structure is pile supported and wood sheeting runs its entire width. The top elevation of the abutments and pier is two feet above the normal water level.

By sounding the concrete in the north abutment it was estimated that approximately 25 per cent of its surface area is deteriorated and delaminated. The west side of the 9 foot thick north abutment contains extensive deterioration in the upper portion. Cores #2 and #3, taken vertically through the top of this abutment, show that the deterioration extends to a depth of over 2 feet. The adjacent splay wall, which is three feet thick at the top and tapers to 9 feet thick at the bottom, appears to be in acceptable condition. Core #1, taken from this splay wall, contained only a few small fracture planes throughout its 13 inch depth. Core #1 had a compressive strength of 5,470 p.s.i.

North abutment, west half; note deterioration next to the gate

The upper portion of the east end of this north abutment has been recently repaired. Soundings of the area around the repair indicated that additional delaminated concrete is present.

Both the east and west halves of the south abutment and splay walls contain numerous areas of efflorescent covered cracks similar to those observed on the north abutment. Core #4, taken in an area of typical condition, contained deteriorated concrete for the first 8.5 inches and then only an occasional, minute fracture plane for the remainder of its depth. Generally, the most prevalent areas of deterioration, estimated to be 45 per cent of the total surface area of this abutment, are above the waterline where freeze-thaw cycles have caused scaling and cracking.

The center pier also contains the most deterioration above the water line. Overall, an estimated 75 per cent of the surface area of this pier contained some form of deterioration. Core #6, which was taken vertically through the top, indicated deterioration to a minimum depth of 27 inches. Sounding of the pier top revealed that it is completely delaminated. Core #5, taken in a typical area below the waterline, contained cracking and delamination to an 8 inch depth.

The concrete in the footings and sills could not be inspected as they were covered. However, as this concrete has not been subjected to freeze-thaw cycles, we conclude that the concrete is in good condition.

Conclusion

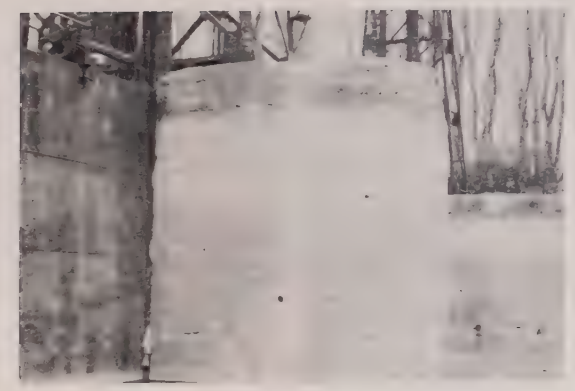
No areas requiring immediate repair were located on this structure.

Future repairs are required to the east and west sections of the

North abutment, east half; note repair adjacent to the gate

South abutment, west half

South abutment, east half



Center pier, west side looking south; Note core hole 5

north abutment adjacent to the gate. Deterioration in excess of 24 inches is present in the west side. Deterioration exists in back of the repaired area on the east side of the gate as sound concrete was not reached when this area was repaired.

Future repair is also needed to the top of the center pier above the waterline where serious scaling and delamination have occurred.

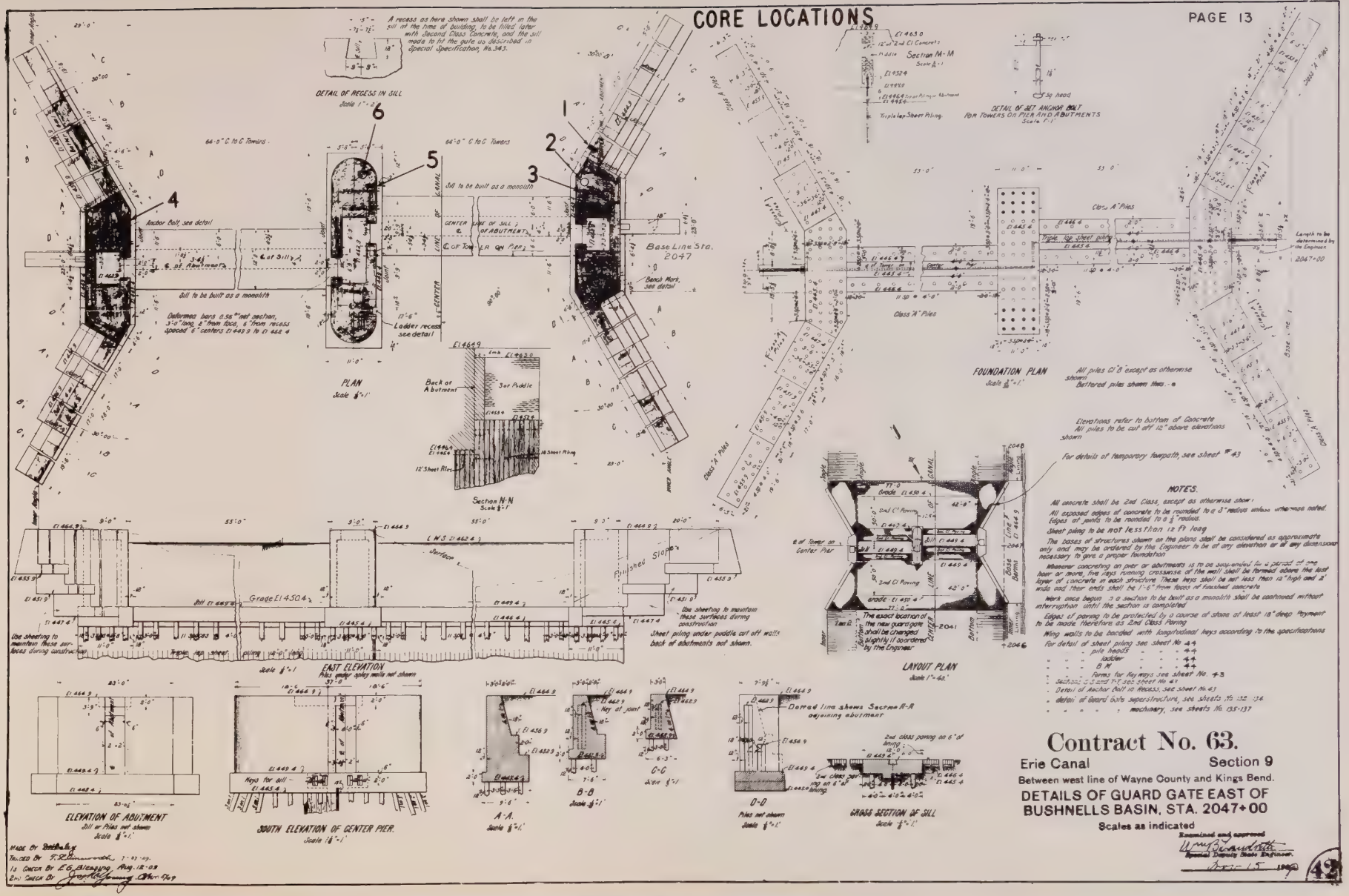
The remainder of this structure exhibits surface deterioration in the form of scaling, cracking, and delaminations that range from 1 to 8 inches in depth. Since this depth of deterioration is only a small fraction of the total depth of concrete in this structure, this condition is not detrimental to the safety or operation of the structure at the present time.

Center pier, east side, looking north

BUSHNELL BASIN GUARD GATE

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
1	North Abutment West of Gate 4' from bottom	0	0	1 @ 7.5"	13"	13"	Tiny fracture planes throughout depth.
2	North Abutment 10' West of Gate 2' from canal edge	0.5"	19"	0	19"	19"	Drilled vertically into top of wall.
3	North Abutment 10' west of gate 2' from canal edge	0.5"	22"	0	22"	22"	Drilled vertically into top of wall.
4	South Abutment West of Gate 4' from bottom	0	8.5"	1 @ 5.5"	13"	13"	Tiny fracture planes below 8.5"
5	Center Pier, North Side, West of Gate, 4' from bottom	0	8"	0	12"	12"	
6	Top of Center Pier West of Gate 4' from canal edge	0	27"	0	27"	27"	Drilled vertically into top of wall.

CORE LOCATIONS



Contract No. 63.

Erie Canal — Section 9

Between west line of Wayne County and Kings Bend.

DETAILS OF GUARD GATE EAST OF BUSHNELLS BASIN, STA. 2047+00

Scales as indicated

Examined and approved
Wm. Bernard Ford
Special Deputy State Engineer.
Dec 15 1909

Made Dr. Bethelby
Traced Dr. F.R. Simmonds, 7-27-09.
1st Check Dr. E.G. Blessing, Aug. 12-09
2nd Check Dr. [illegible]

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BUSHNELL BASIN TROUGH

The Bushnell Basin Trough is the first vertical walled section west of the Bushnell Basin Guard Gate. In this area, the canal is located on an earth embankment that ranges up to 40 feet in height above the adjacent land. As first constructed, this section of the canal was contained by earth embankments as it followed the alignment of the then existing Erie Canal. During widening of this section for construction of the Barge Canal in 1911, a breach occurred that necessitated the building of the Bushnell Basin Retaining Wall. As a result, contracts were altered to line this earth embankment section with portland cement concrete.

During 1912, a vertical concrete gravity wall was constructed on the north side of the canal. Plans existing at that time called for a concrete floor and concrete-lined embankment to be built on the south side. However, in 1914, plans were again altered to construct a gravity wall on the south side of the canal also. The resulting Bushnell Basin Trough, with vertical gravity walls on both sides and a concrete-lined floor, extends westerly approximately 900 feet from where I-490 now crosses the canal.

Presently, the entire section of the canal from I-490 to the Cartersville Guard Gate, a distance of approximately 2 miles, is concrete-lined with either vertical gravity walled sections (as this Bushnell Basin Trough) or with concrete-lined embankments.

The Bushnell Basin Trough, including splay walls, has a length of 906 feet and a width of 91.5 feet. It is composed of 27 wall panels on the north side and 28 panels on the south side. Each

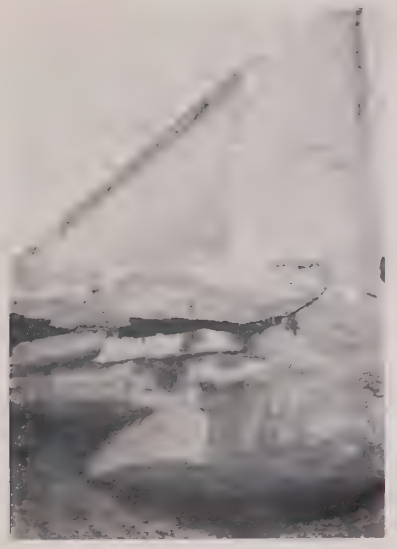
View of breach in trough, looking east
I-490 Bridge in background

South wall east of breach

wall panel is approximately 30 feet long, 17 feet high and tapers from a 2 foot thickness at the top to an 8 foot thickness at the bottom. As shown on the original construction plans, the trough floor consists of a 12 inch thick concrete bottom slab, a 0.5 inch tar felt waterproofing membrane, a 6 inch sand cushion layer and a 4 inch concrete top slab.

On October 29, 1974, the concrete floor collapsed into a sewer tunnel being constructed under this section of the canal. The breach occurred near the center of the trough and left an approximate 95 foot by 100 foot hole in the floor. Both gravity walls remained intact after the breach although they had no bottom support for over 120 feet. This indicates the good condition of the concrete in these walls. Subsequently, 7 wall panels were removed from each side of the canal to permit repair of a 250 foot long section.

Of the 20 remaining wall panels on the north side of the canal, 14 panels exhibit little or no deterioration. Five panels show surface deterioration over approximately one half of their area and 1 panel exhibits surface deterioration over most of its area. Overall, approximately 15 per cent of the north wall area exhibits scaling and delaminations. Cores taken in these panels reveal that the majority of the deterioration only exists on the wall surface. However, scaling and cracking is common along the top of the walls above the normal waterline. This deterioration can be attributed to freeze-thaw cycles. Cores taken along the top of the wall reveal



Cross section of trough wall and footing at breach

North wall east of breach

that this deterioration extends into the wall to a depth of 10.5 inches.

A few areas on this wall have been previously refaced with shotcrete, but presently these patches are only loosely bonded to the original concrete. Removal of these shotcrete patches in 2 areas revealed that the original concrete under the patch contained only surface deterioration.

The condition of the south wall is very similar to that of the north wall. Surface deterioration is evident over approximately 20 per cent of this wall area. Of the 21 remaining panels, 13 panels exhibit little or no deterioration, 5 panels show scaling and delaminations over approximately one half of their surface and 3 panels show this type of deterioration over most of their surfaces. The maximum depth of scaling on any of these panels was 2 inches. Isolated areas of the wall have been repaired with shotcrete, but as was observed on the north wall, this shotcrete is only loosely bonded to the original concrete. A core taken in one of these shotcreted areas revealed that delaminated concrete existed to a depth of 7.5 inches.

Conclusions

The majority of the present deterioration extends into the walls to a depth of 1 to 2 inches and poses no problem except that it detracts from the appearance of the walls. Soundings indicated that no large areas of either wall contained deep delaminations.

North wall west of breach

South wall west of breach

Deeper deterioration exists in the upper portion of both gravity walls and future repairs will be required in these areas.

Compressive strengths of 4420 and 4910 p.s.i., obtained on Cores # 1 and # 5, respectively, attest to the good overall condition of the concrete in these two walls.

No immediate repairs are required in this trough, except for the section presently under contract to repair the breach.

South wall west of breach

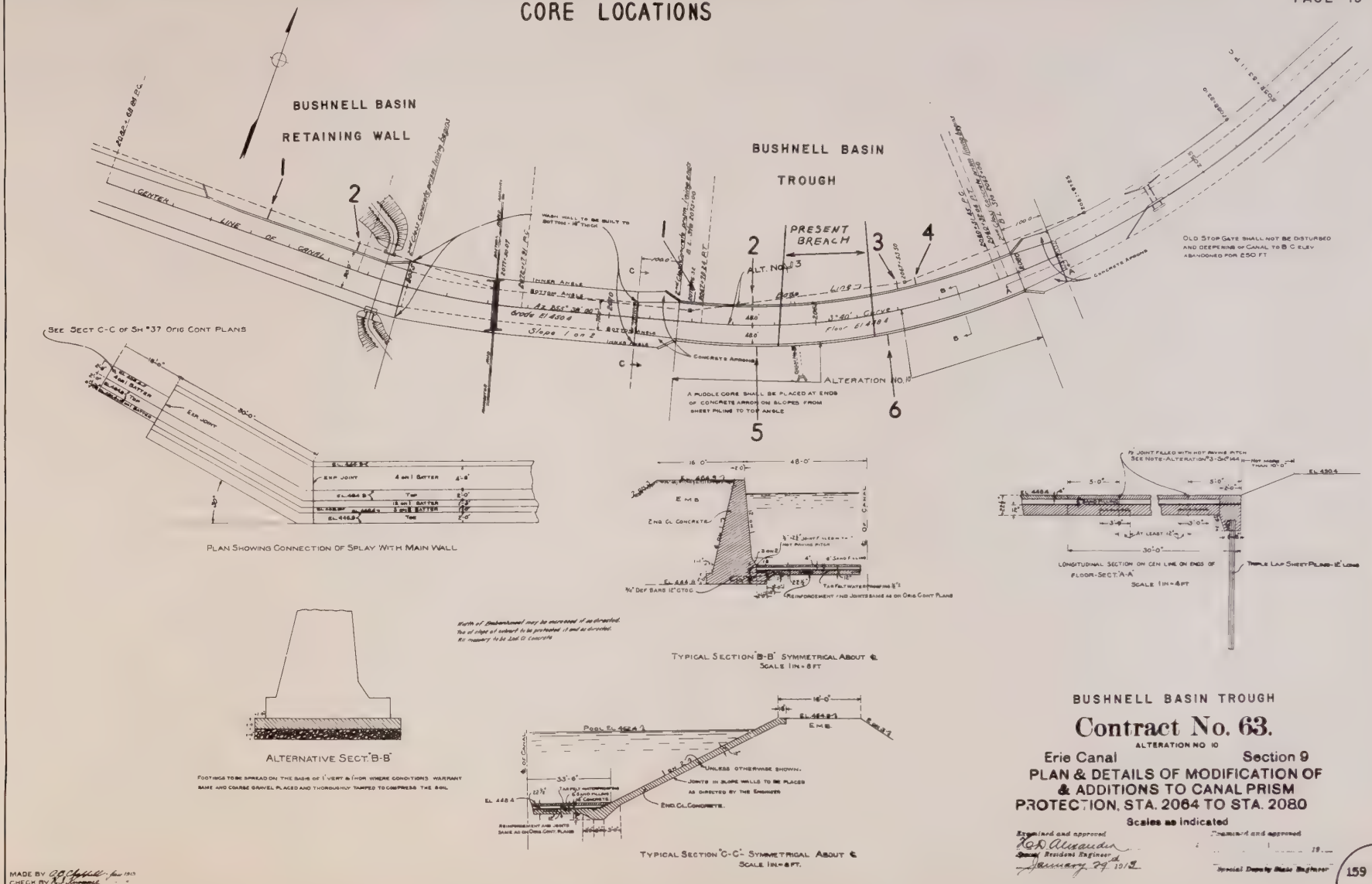
Repairs underway in breach

Exposed rear face of wall at breach

BUSHNELL BASIN TROUGH

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
1	North side 175' west of breach 12" from canal edge	0	0	0	11.5"	11.5"	Drilled vertically into top of wall.
2	North side 50' west of breach 4' from bottom	0	0	1 @ 4"	13.5"	13.5"	
3	North side 70' east of breach 6' from bottom	0	0	6"	13.5"	13.5"	
4	North side 100' east of breach 8" from canal edge	0.5"	10.5"	1 @ 10.5"	18"	18"	Drilled vertically into top of wall.
5	South side 50' west of breach 4' from bottom	0	0	1 @ 7"	13.5"	13.5"	
6	South side 12' east of breach 5' from bottom	1" shotcrete	7.5"	0	12"	12"	Taken from shotcrete area.

CORE LOCATIONS



BUSHNELL BASIN TROUGH

Contract No. 63.

ALTERATION NO 10

Erie Canal Section 9

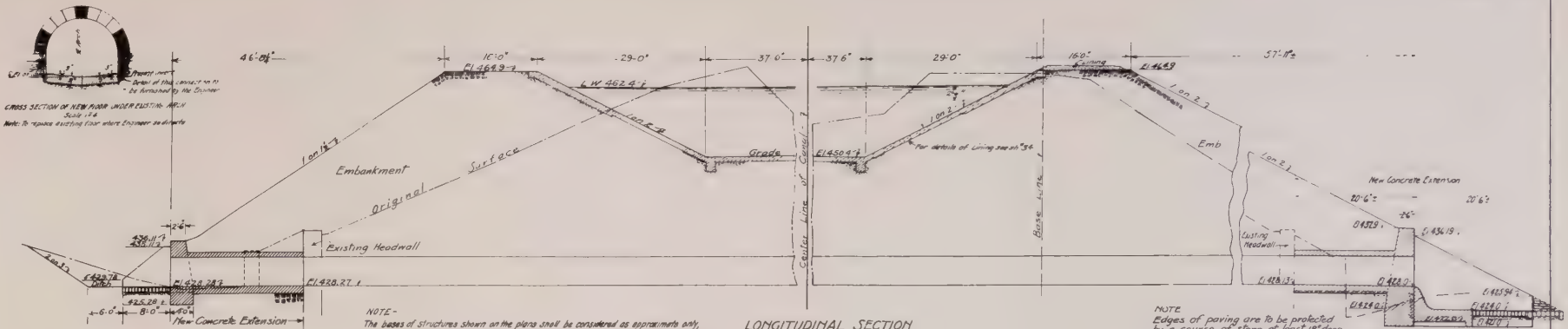
PLAN & DETAILS OF MODIFICATION OF & ADDITIONS TO CANAL PRISM PROTECTION, STA. 2064 TO STA. 2080

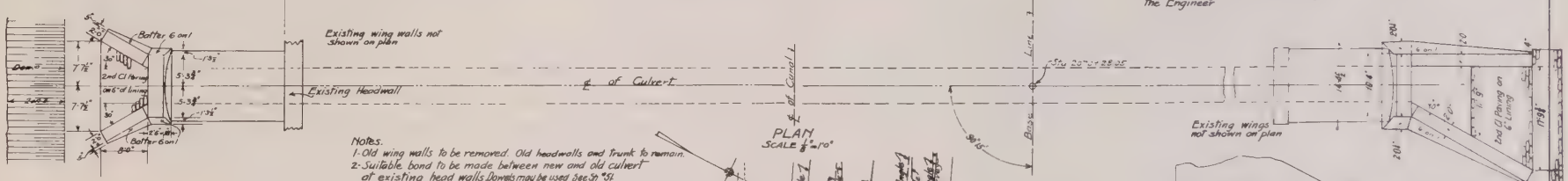
Scales as indicated

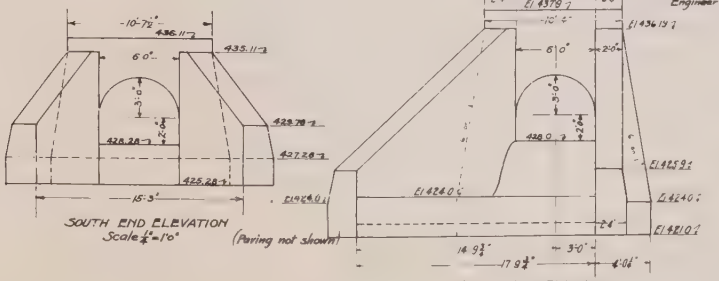
Examined and approved
R. D. Alexander
Special Resident Engineer
January 29th 1912

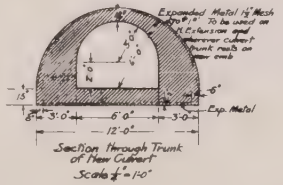
Examined and approved
19
Special Deputy State Engineer

159









CANAL SECTION PRIOR TO

BUSHNELL BASIN TROUGH

Contract No. 63.

Erie Canal — Section 9

Between west line of Wayne County and Kings Bend

DETAIL PLANS FOR CULVERT AT STA. 2070+28

OLD CULVERT NO. 29

Scales as indicated

Examined and approved

Deputy State Engineer

Dec 10 1918

MADE BY Dr Daly

TRACED BY

1st. CHECK BY

2nd. CHECK BY

48

BUSHNELL BASIN RETAINING WALL

In the area of Bushnell Basin, the canal is carried on an earth embankment that ranges to over 40 feet in height. While under construction in 1911, high water and possible construction negligence caused a section of this canal embankment to fail. The Bushnell Basin retaining wall was then immediately built to repair this break. To guard against future sudden accidents, the original contract plans were altered to carry the canal over this area in a concrete lined section.

The wall is located on the north side of the canal just west of the vertical walled Bushnell Basin Trough. It is 530 feet in length, 16.5 feet high, 8 feet wide at the bottom and tapers to 2 feet wide at the top. Each of the 16 wall panels are 30 feet in length and splay walls at both ends taper back into the concrete lined, sloped embankment.

The 7 wall panels and the splay wall on the eastern end of the retaining wall are in good condition. Isolated areas of scaling and other deterioration is occurring in the top 2 feet of the wall which is above the normal water level. No delamination was detected by sounding the lower 6 feet of this wall section. Core #2, taken out of the 2nd panel from the east end, was in excellent condition and confirmed the soundings. This core had a compressive strength of 8,580 p.s.i.

The western 9 wall panels and splay wall are distinctly different from the eastern section. The top 1 to 2 feet of these walls have been recapped with concrete and all these panels have been refaced

East Section

with an estimated 3 to 6 inches of concrete. Sounding revealed that this facing is loosely bonded to the original concrete wall. Core #1 contained a 4 inch section of refaced concrete, 3 inches of fractured concrete, and then 7 inches of concrete containing a few fracture planes. Based upon the condition of the lower portion of this core, we estimate that sound concrete would be reached approximately 6 inches further into the panel. Therefore, in the panel represented by Core #1, deteriorated concrete exists to a depth of approximately 20 inches. The total thickness of the panel in the area of Core #1 is 6 feet.

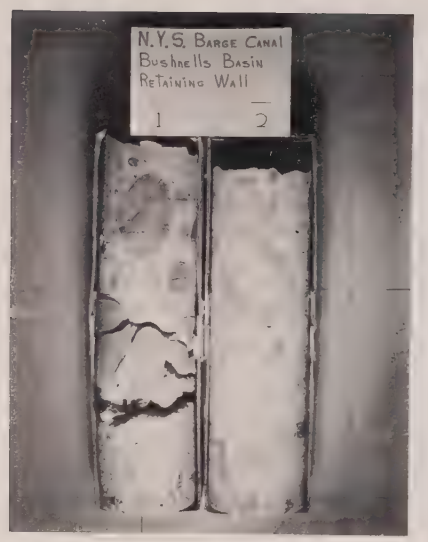
A comparison of Cores #1 and 2 reveals that different types of aggregate were used in these two wall sections. Core #1 contains uncrushed gravel similar to that observed in other concrete structures in this area of the canal. Core #2 contains a crushed gravel only found in this wall to date.

Conclusion

The east section of this retaining wall is in good condition with little deterioration noted. The west section exhibits extensive deterioration. Even though this deterioration extends into the wall for a depth of 1 to 1.5 feet, this is considered a surface condition considering the total wall thickness. This deterioration has no present detrimental effect on the function of the wall. No repairs are required at the present time.

West Section

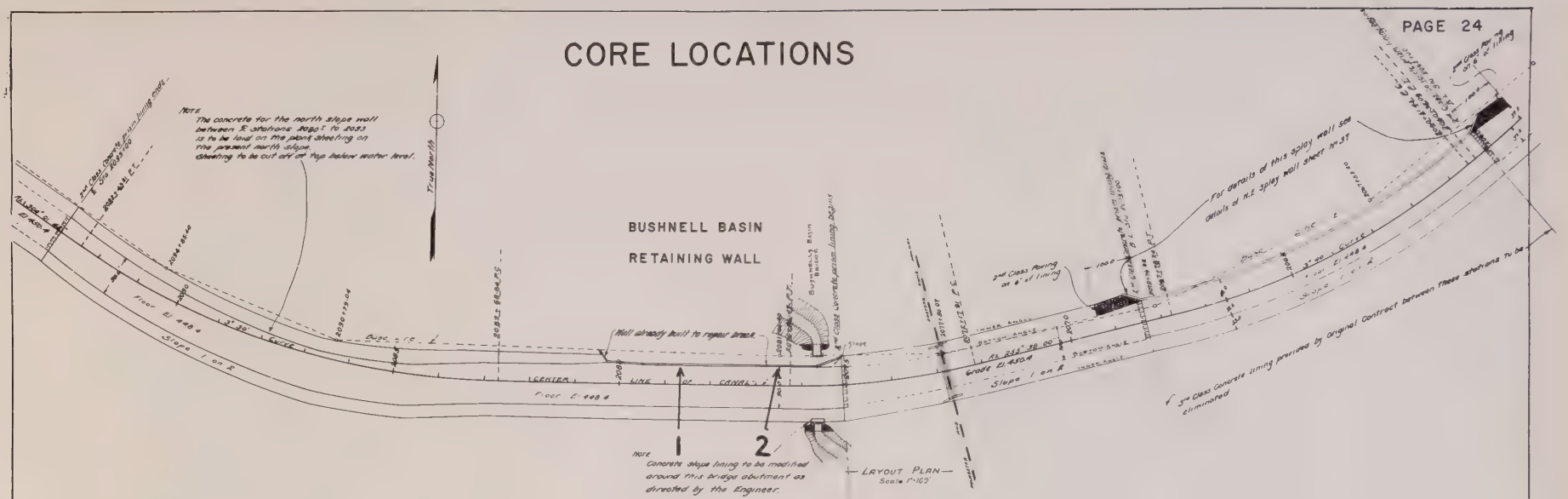
Middle Wall Panels, Note deterioration of refacing.



BUSHNELL BASIN RETAINING WALL

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
1	150' from west end 3' from bottom	--	14"	0	14"	14"	West half of wall refaced.
2	75' from east end 4' from bottom	0	0	0	13.5"	13.5"	

CORE LOCATIONS



Joseph Ripley
W. McE. Barnard
W. A. Ryan
L. S. Greene Jr.
Edward Hamilton

All masonry shown on this plan to be second class concrete.
The upper 4" layer of concrete in floor is to be divided by joints into sections approximately 16' square. Lower layer 30' squares
Joints in wall and floor must not coincide.
For detail of reinforcement in floor see sheet No 144.
For detail of end of floor see sheet No 144.
All details not shown, to be furnished by the Engineer.
For general plan of joints see Sh. No. 37.
End of floor to be protected by bags of sand or as determined by the Engineer

BUSHNELL BASIN RETAINING WALL

Contract No. 63.

ALTERATION NO. 3

Erie Canal — Section 9

PLAN & DETAILS OF ALTERATIONS & ADDITIONS TO CANAL PRISM PROTECTION STA. 2059 TO 2094

Scales as indicated

Engineered and approved
H. A. Alexander
Principal Resident Engineer

Examined and approved
November 15 1904
Alv. A. Fuertes
Superintending Canal Engineer

Made by [illegible]
Traced by [illegible]
1st Check [illegible]
2nd Check [illegible]

BUSHNELL BASIN WASTE GATE

The Bushnell Basin Waste Gate is located on the north side of the canal (Station 2094) between the Bushnell Basin Retaining Wall and the Irondequoit Trough. It was used to drain that section of the canal between the Bushnell Basin Guard Gate and the Cartersville Guard Gate. At the present time, however, this gate cannot be opened due to residential development in the drainage channel.

Overall, this structure is 24 feet wide, 18.5 feet high and supported by a 4 foot thick slab on piles. Each of the three sluice gate openings is 3 feet square and the gates are raised and lowered by manually operated wheel cranks. The 3 foot thick gate wall is supported on the front side by two 16 foot high buttress columns. These columns also support a 10 foot wide concrete slab that carries the tow path over this gate. Two inch deep scaling was noted in a few small areas of this 2 foot thick slab. However, the majority of the slab is covered with gravel.

The most prominent concrete deterioration in this structure is in the upper sections of the stop log columns. These columns, on the canal or south side of the gate, contain scaling and deterioration approximately 1 foot deep in their upper halves. These upper sections are visibly delaminated. The lower halves are intact, but soundings indicate delaminations are present. Overall, approximately 60% of the column surface area sounded delaminated.

The middle section of the gate wall panels facing the canal contain some scaled areas up to 2 inches deep. A core taken next to a scaled area on the center panel contained small fracture planes throughout

Waste Gate as viewed from the canal side

the depth of this 13 inch core. Overall, only 15 percent of the gate wall surface area sounded delaminated.

Although both wingwalls contain few scaled areas, about 75% of both wingwall areas sounded delaminated.

The north side of the waste gate, which provides the most critical support, is in very good condition except for a few small areas of efflorescence and staining near the normal water level. No scaling, delamination or other deterioration was detected on any other areas of the front side of this gate. A few small areas of efflorescence were noted on the slab bottom, but otherwise it appeared in good condition.

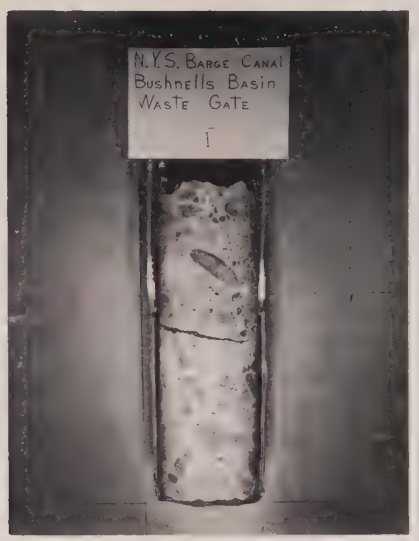
Conclusion

The north side of the waste gate is presently in very good condition. The south or canal side of the gate is in fair condition. Isolated areas of the waste gate, such as the upper stop log columns and the upper sections of the 3 foot thick gate, contain deep deterioration.

Since the gate is not presently useable, repairs to the stop log columns are not necessary. Repairs to other areas containing delaminations and scaling are not required at this time.

Top of Bushnell Basin Waste Gate looking east

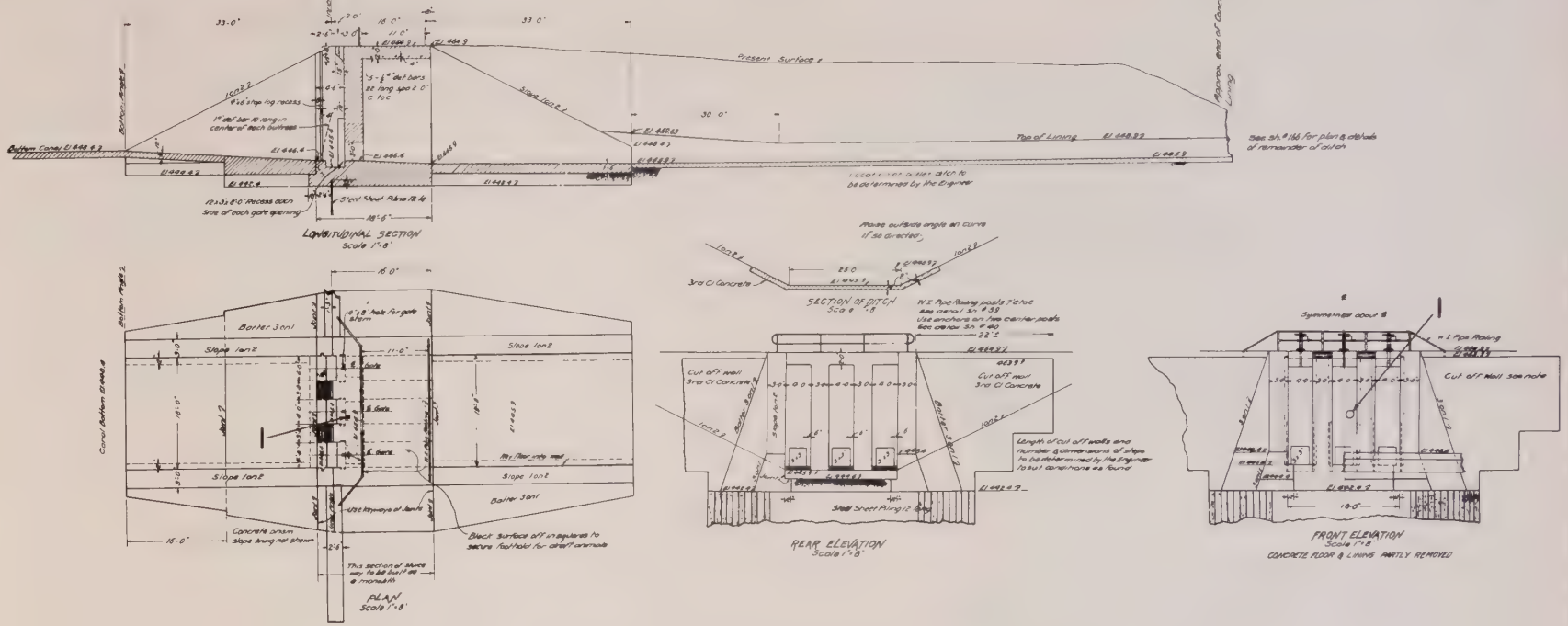
North side of Waste Gate



BUSHNELL BASIN WASTE GATE

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
1	south side of gate middle panel 6.5' from bottom	0.5"	13"	0	13"	13"	Fractures stop at bottom of core. Top section of core had a compressive strength of 4550 psi.

CORE LOCATIONS



Notes:

All masonry shown on this plan to be 2nd Class Concrete except cut off walls and ditch lining which are to be constructed of 3rd Class Concrete

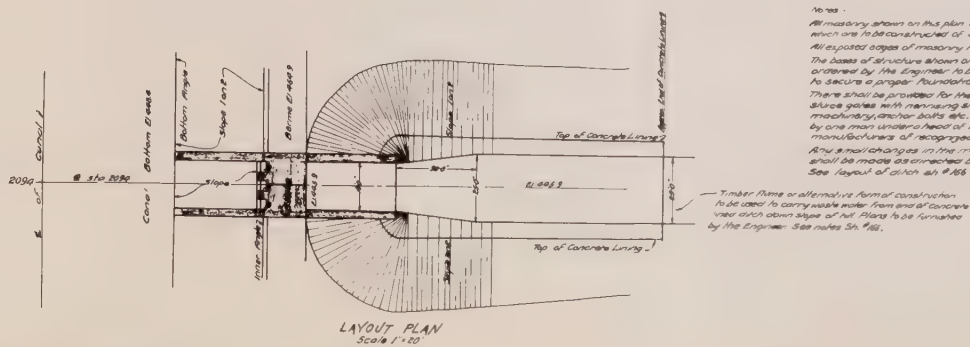
All exposed edges of masonry to be rounded to a radius of 3" unless otherwise shown

The bases of structure shown on this sheet are approximate only and may be ordered by the Engineer to be of any dimensions or at any elevations necessary to secure a proper foundation

There shall be provided for the gate openings shown on this plan three 36"x36" rectangular sluice gates with nennings stems together with the necessary standards, operating machinery, anchor bolts etc. These gates are to be capable of being easily operated by one man under a head of 16 feet. They are to be up to the standard of practice of manufacturers of recognized standing and acceptable to the Engineer

Any small changes in the masonry made necessary by the type of gate used shall be made as directed by the Engineer.

See layout of ditch sh. #166



Contract No. 63.

ALTERATION NO 13

Erie Canal — Section 9

DETAIL PLAN OF WASTE GATES NEAR BUSHNELLS BASIN

Scales as indicated

Examined and approved
K. L. Alexander
Special Resident Engineer
February 3 1916

Examined and approved
February 3 1914
Alex. E. Hastl
Special Deputy State Engineer

165

Made by [illegible]
Traced by [illegible]
1st Check by [illegible]
2nd Check by [illegible]

CONCRETE LINED SECTIONS

Between the Bushnell Basin Trough and the Cartersville Guard Gate, two sections of the canal embankment are lined with concrete that is sloped 1 foot vertical to 2 feet horizontal (1 on 2 slope). One section, between the Bushnell Basin Trough and the Irondequoit Trough, is approximately 3100 feet long, except for the 530 foot long Bushnell Basin Retaining Wall on the north embankment. The other section between the Irondequoit Trough and the Cartersville Guard Gate is approximately 3400 feet in length.

The width of the floor in these sections is 67 feet with the canal widening to 133 feet at the top of the sloping concrete lined embankment. According to the original construction plans, the sloped lining is 12 inches thick. As shown on the plans, the floor consists of a 12 inch thick concrete bottom slab, a 0.5 inch thick tar felt waterproofing membrane, a 6 inch sand cushion and a 4 inch thick concrete top slab.

Presently, these sloping concrete linings exhibit extensive cracking, settlement and general deterioration in numerous locations along the canal. A few sections, most notably where homes border the canal, have been repaired either by relining these sections with new concrete or covering the deteriorated concrete lining with shotcrete. The one area which has been relined with new concrete appeared to be in good condition while the shotcrete repairs are not bonded to the underlying concrete and will soon dislodge.

The canal floor lining could not be inspected as it was covered with silt and water.

Concrete lined canal section as viewed from the Irondequoit Trough, looking East

South side between Bushnell Basin Trough and Bushnell Basin Retaining Wall

Conclusion

Although the sloped linings show extensive deterioration, the main function of this concrete lining is to prevent water erosion of the embankment. The earth embankment serves to contain the canal and control the seepage of water. Therefore, the concrete lining, in its present condition, serves this purpose of stabilizing the embankments and is not in need of any major repair. Isolated areas of the embankment have been eroded in a few sections where the lining is severely deteriorated. This erosion has resulted in both settlement and depressions under the lining. Repairs to the lining in these sections should be made to prevent any further erosion.

We conclude that the concrete floor lining is in good condition since the continuous covering of water has prevented weathering.

Lining adjacent to southeast splay wall of Irondequoit Trough

Lining between Bushnell Basin Trough and Bushnell Basin Retaining Wall, looking west. Note repaired lining on south side

IRONDEQUOIT TROUGH

The vertical walled Irondequoit Trough begins approximately 0.5 miles east of the Cartersville Guard Gate and extends 3900 feet in an easterly direction. This section of the canal is on a 70 foot high embankment over the Irondequoit Creek.

In 1910, the new Barge Canal alignment coincided with the then present Erie Canal at this location and utilized an existing 22 foot wide by 9 foot high stone arch culvert carrying the Irondequoit Creek under this high embankment. Although the Erie Canal was not concrete lined, the new design for the Barge Canal called for a 2900 foot long concrete gravity walled trough in the area of this culvert.

In 1912, most likely as a result of the breach that occurred in 1911 at Bushnell Basin, the Irondequoit Trough was lengthened on both ends. On the western end, the vertical gravity walls were extended approximately 100 feet and the floor and embankments lined with concrete for another 250 feet. On the eastern end, the vertical gravity walls were extended over 900 feet.

On September 3, 1912, the culvert under this high embankment collapsed causing the trough to break. Approximately 500 feet of the embankment was also washed out. Within 5 weeks of the collapse, a temporary timber trough had been constructed over the breach in order to maintain canal traffic. The timber trough was 887 feet long, 22 feet wide, 7 feet deep and supported by piles.

East end of trough looking west

North wall panels 54-59 from east end, note core hole 6

Between 1913 and 1915, a new culvert was built to carry Irondequoit Creek under the embankment and plans were formulated for repairs. This new concrete culvert was approximately 500 feet long, steel-reinforced, and consisted of twin 9 x 12 foot box culverts.

During 1916 repairs were started on the breach. This new (and present) section of the Irondequoit Trough has a 6.5 foot high by 3 foot wide by 600 foot long inspection tunnel in each trough wall. These tunnels are used to monitor any possible water leakage through the top concrete layer of the double slab, trough floor. Possibly to allow for barge passage near the middle of this long trough, the new vertical wall on the south side of the breach area was set back 8 feet further than the previous one. Thus, this middle section has a width of 104 feet while the end sections of the trough have widths of 96 feet.

The 96 foot wide end sections have wall panels that are 30 feet long and 16.5 feet high. These taper from a 2 feet thickness at the top to approximately 8 feet at the bottom of the trough. The gravity walls that contain the inspection tunnels are also 2 feet wide at the top, but 8 feet below the top, the walls step back 3 feet into the embankment to accommodate the tunnels. Thus, the wall is 3.5 feet thick between the tunnel and the canal.

The concrete in the south side of the trough is in generally good condition with approximately 15 per cent of its surface showing some form of deterioration. Approximately 104 of the 128 panels show little or no deterioration, 20 panels show deterioration over about

South wall panels 93-98 from east end

North wall panels 77-79 from east end
Center panel extensively repaired

half of their surface area, and 4 show deterioration over most of their surfaces. Deterioration exists in the form of scaling, cracking, and delaminations. Some scaling is as deep as 8 inches, but the majority is only 2 inches in depth. Five panels have been repaired with shotcrete and the top portions of five panels have been repaired with concrete. Delaminations were determined by sounding the walls along the lower 6 feet with a hammer.

Cores taken in the most deteriorated areas of the walls revealed that cracking exists to a depth of 18 inches. These cores were taken along the construction joints and the deterioration was most probably caused by seepage of water along and through these joints. Another core taken in a scaled area shows deterioration exists no deeper than 2 1/2 inches.

The majority of the concrete in the north side of the trough is also in good condition. Approximately 20 per cent of its entire surface area exhibits some type of deterioration. Of the 127 panels, 80 panels show little or no deterioration over their surface area, 44 show deterioration over approximately half of their surface, and 5 show deterioration over most of their surfaces. As was observed on the south wall, this deterioration exists as a combination of scaling, cracking, and delaminations.

Depth of the scaling is generally 2 inches or less. In only one area of this wall was the scaling found to exist to a depth of 8 inches.

North wall, panels 112-115 from east end

South wall panels 110-128 from east end
Note irregular horizontal crack at top of wall

Cores taken in this wall revealed that cracking and delaminations existed to a depth of 13.5 inches. However, the cores generally showed that this type of deterioration was limited to less than 1 foot in depth.

Repairs have been previously made to 14 of the panels on this wall. These repairs consisted of removing the deteriorated concrete, reforming the wall and replacing with new concrete. The majority of these repairs were in good condition.

On the north wall, panels 63 - 65 from the east end protrude into the canal a few inches. The absence of any cracks or other signs of movement indicated that this occurred during original construction.

On the south wall, panel 116 from the east end contains a horizontal crack that ranges between 2 and 4 feet below the top. The crack was only about ¼ inch wide. Directly behind this wall area is a depression about 1 foot deep and 6 feet long which indicates that soil is slowly being washed through this crack into the canal. This poses a localized problem that can be remedied by filling the depression and sealing the crack.

The inspection tunnels in both walls contained a few areas of efflorescence, but generally the concrete appeared to be in very good condition. All construction joints in these tunnels showed signs of leakage. This leakage is often indicated by the formation of soda straws. We conclude that the majority of this leakage has resulted from the infiltration of ground water, not

North inspection tunnel, west end, construction joint leakage indicated by soda straws

North inspection tunnel, west end, leakage along crack indicated by efflorescence

discolored canal water, as most of the efflorescence is white in color.

Cores #6 and 11 had compressive strengths of 4,770 and 2,170 p.s.i., respectively. A detailed inspection of Core #11 revealed that its relatively low compressive strength was most likely caused by weak mortar on one side of the core and lack of proper concrete consolidation during construction.

Conclusion

The majority of the concrete in both vertical gravity walls of the Irondequoit Trough is in good condition. Most of the deterioration is limited to the top few inches of the exposed concrete surface.

Two cores revealed that deeper deterioration exists in the vicinity of the construction joints. This deterioration is not indicative of the overall condition of the concrete in these two walls.

The negligible amount of water seeping through the construction joints is not detrimental to the stability of the embankment.

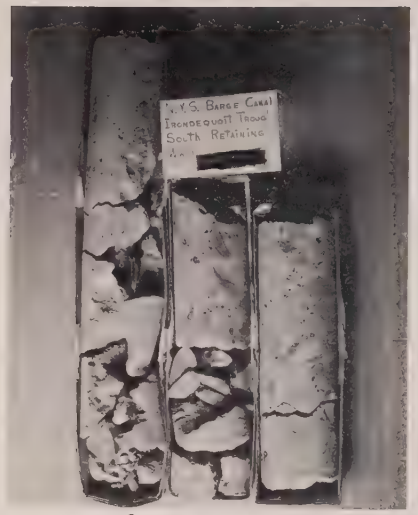
No immediate repairs are required on these walls. Future repairs should include sealing all open joints with a cement grout.

North wall, panels 121-115 from east end

North wall near Core # 6; Note misalignment of wall that occurred during construction

IRONDEQUOIT TROUGH CORES

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
1	North side 100' from east end 4' from bottom	0*	10"	0	13.5"	13.5"	
2	North side 240' from east end 11" from canal edge	0*	11"	0	11.0"	11"	Drilled vertically from top of wall.
3	North side 575' from east end 3' from bottom	0.5"*	5.5"	1 @ 8.5"	12.0"	12.0"	
4	North side 1210' from east end 12" from canal edge	0	13.5"	0	13.5"	13.5"	Drilled vertically from top of wall.
5	North side 1260' from east end 2' from bottom	0	5.5"	0	13.5"	13.5"	
6	North side 1760' from east end 5' from bottom	1"*	4.5"	0	13"	14"	Core taken from ladder well.
7	North side 2360' from east end 4.5' from bottom	0	11.5"	0	14"	14"	
8	North side 3210' from east end 4.5' from bottom	0	11"	1 @ 13" and 19"	26"	26"	

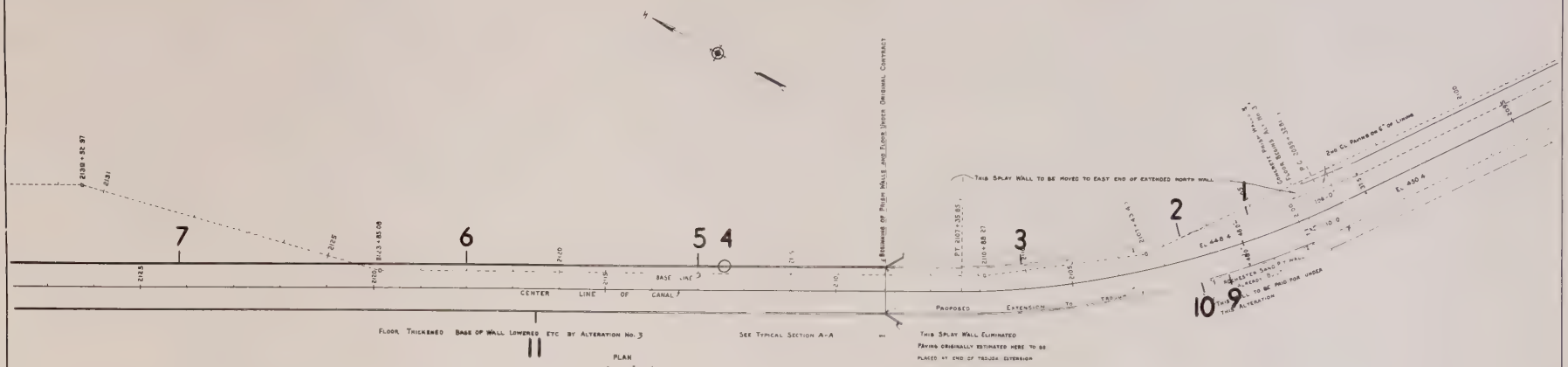


10 9 11

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
9	South side 170' from east end 4' from bottom	0	16"	0	16"	16"	
10	South side 245' from east end 3' from bottom	3"	18"	17"	21"	24"	Core taken through construction joint.
11	South side 240' from east end 4.5' from bottom	1"*	2.5"	5"	14"	15"	

* Data estimated

CORE LOCATIONS

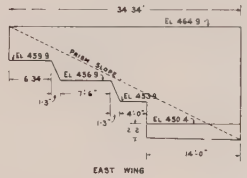


PLAN
SCALE 1" = 100'

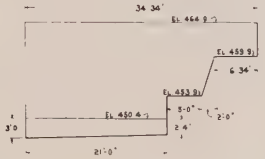
GENERAL NOTES

ALL MASONRY SHOWN ON THIS PLAN TO BE SECOND CLASS CONCRETE
FOR DETAILS OF JOINTS IN FLOOR, SEE SHEET NO 37
ALL DETAILS NOT SHOWN TO BE FURNISHED BY THE ENGINEER

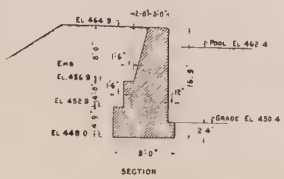
FOR TYPICAL CROSS SECTIONS OF TROUGH EXTENSION, SEE SHEET NO 145
END OF FLOOR TO BE PROTECTED BY BAGS OF SAND OR AS DETERMINED BY THE ENGINEER



EAST WING

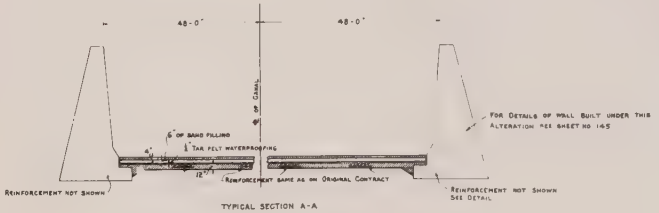


WEST WING

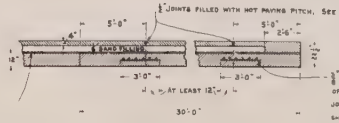


SECTION

DETAILS OF WALL ON SOUTH SIDE ADJACENT TO ROCHESTER SAND CO
SCALE 1" = 8'

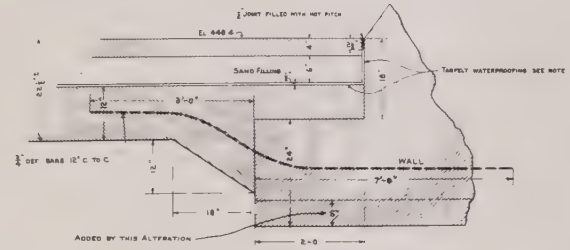


TYPICAL SECTION A-A
(SHOWING PROPOSED NEW FLOOR)
SCALE 1" = 8



LONGITUDINAL SECTION ON CEN LINE ON ENDS OF FLOOR
SCALE 1" = 4

WATERPROOFING SHALL CONSIST OF 5 THICKNESSES SINGLE-PLY COAL TAR FELT LAID WITH BUTT JOINTS, DIFFERENT LAYERS BREAKING JOINTS ABOUT 6" SIX MOPPINGS OF HOT PITCH SHALL BE APPLIED ONE TO THE TOP SURFACE OF LOWER LAYER OF CONCRETE AND ONE TO EACH LAYER OF FELT IMMEDIATELY BEFORE THE NEW LAYER IS PLACED. SEE SPECIAL SPECIFICATIONS



SECTION SHOWING CONNECTION OF FLOOR TO WALL
SCALE 1" = 1'-0"

THE UPPER 2½" OF JOINTS IN TOP LAYER OF FLOOR TO BE ½" WIDE AND FILLED WITH HOT PAVING PITCH
ALL DETAILS SHOWN ON THIS SHEET SHALL SUPERSEDE THOSE SHOWN ON ORIGINAL CONTRACT PLANS
FOR OTHER DETAILS, SEE SHEET No 37

IRONDEQUOIT TROUGH

Contract No. 63.

ALTERATION NO 3

Erie Canal — Section 9

PLAN & DETAILS OF ALTERATIONS & ADDITIONS TO CANAL PRISM PROTECTION
STA. 2094 TO 2128

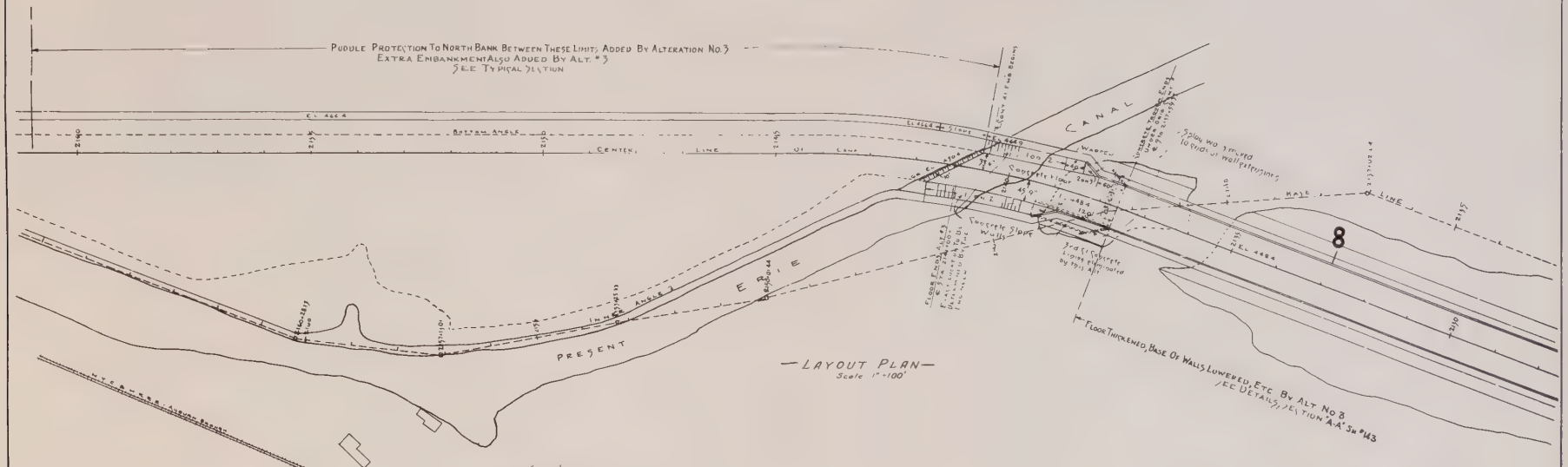
Scales as indicated

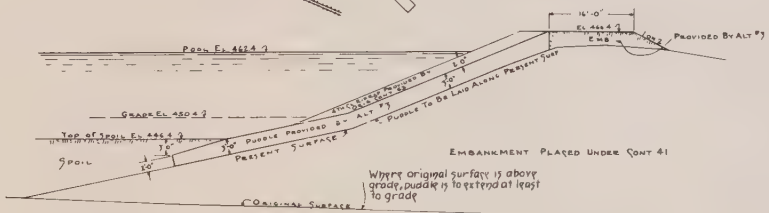
Examined and approved
H. D. Alexander
Special Resident Engineer
November 15th 1911

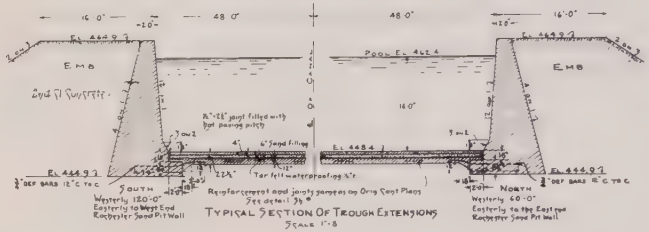
Examined and approved
November 15th 1911
Alex. E. Kastl
Special Deputy State Engineer

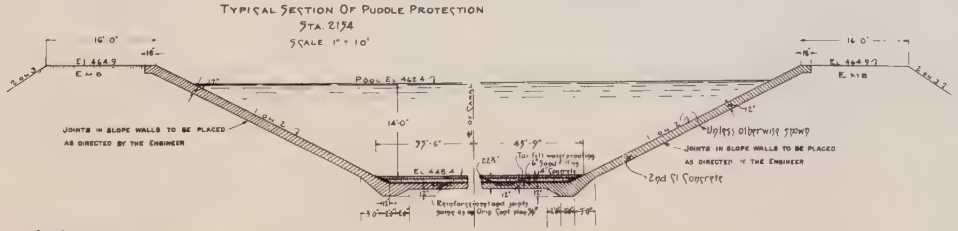
MADE BY
TRACED BY
CHECK BY
2nd CHECK BY

CORE LOCATIONS









GENERAL NOTES

All masonry shown on this sheet to be 2nd Cl Concrete.
For details of joints in floor see Sh # 37.0 Original Contract
For details of floor and floor reinforcement, see Sh #144
All details not shown to be furnished by the Engineer

ENDS OF FLOOR TO BE PROTECTED BY BAGS OF SAND OR AS DETERMINED BY THE ENGINEER

IRONDEQUOIT TROUGH

Contract No. 63.

ALTERATION NO. 3

Erie Canal — Section 9

PLAN & DETAILS OF ALTERATIONS & ADDITIONS TO CANAL PRISM PROTECTION STA. 2128 TO 2161

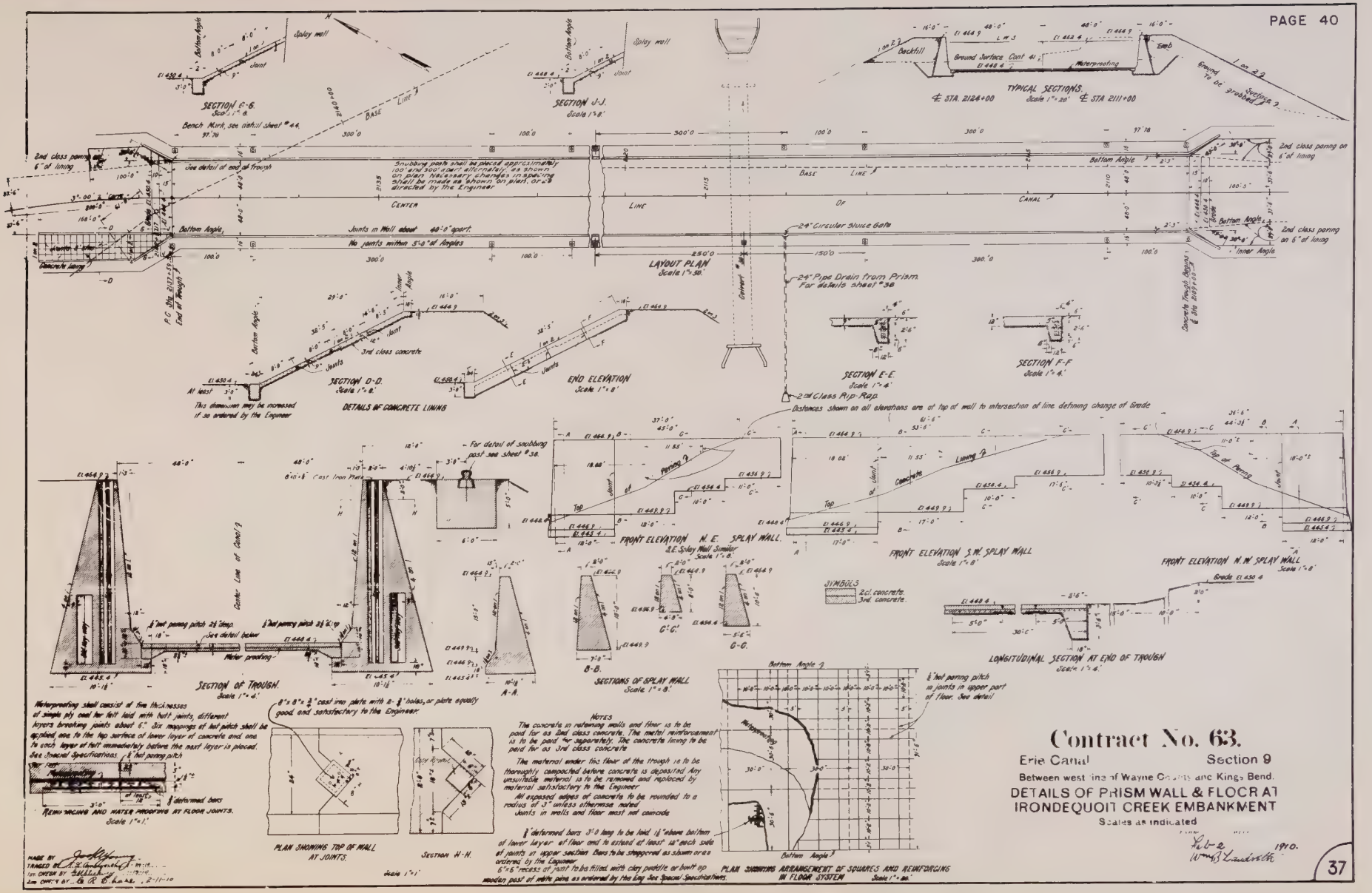
Scales as indicated

Examined and approved
November 15th 1911
Special Resident Engineer

Examined and approved
November 15th 1911
Special Deputy State Engineer

Made By Jos Pribyl
Traced By
Checked By
2nd Check By

143



Contract No. 63.

Erie Canal — Section 9

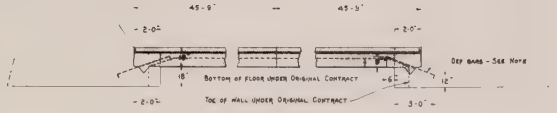
Between west line of Wayne County and Kings Bend.

DETAILS OF PRISM WALL & FLOOR AT IRONDEQUOIT CREEK EMBANKMENT

Scales as indicated

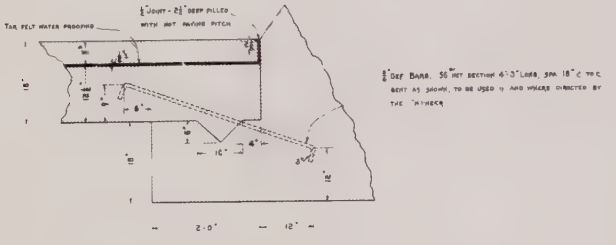
1910.

37



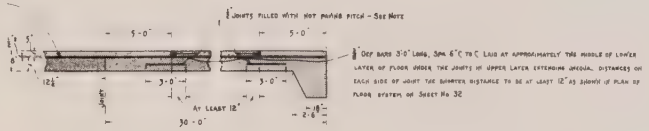
SECTION THROUGH TROUGH
Scale 1" = 4'-0"

Changes in the inner toes of walls shown on this sheet not to affect that portion of wall placed prior to the date of this alteration



SECTION SHOWING CONNECTION OF FLOOR TO WALL
Scale 1" = 1'-0"

Water-proofing shall consist of 3 thicknesses single-ply coal tar felt laid with butt joints, different layers breaking joints about 6". Six mopfuls of hot pitch shall be applied one to the top surface of lower layer of concrete and one to each layer of felt immediately before the next layer is placed. See Special Specifications



Dep bars 3'-0" Long, 3pa 6" c to c Laid at approximately the middle of lower layer of floor under the joints in upper layer extending special distances on each side of joint the shorter distance to be at least 12" as shown in plan of floor system on Sheet No 32

LONGITUDINAL SECTION ON ℄ ON ENDS OF FLOOR
Scale 1" = 4'-0"

The upper 2½" of joints in top layer of floor to be ½" wide and filled with hot paving pitch.
All Details shown on this Key Y shall supercede those shown on Original Contract Plans. For other details see sheets No 29 and 32
All masonry shown on this sheet to be Second Class Concrete

Contract No. 63.

ALERTATION NO. 2

Erie Canal Section 9

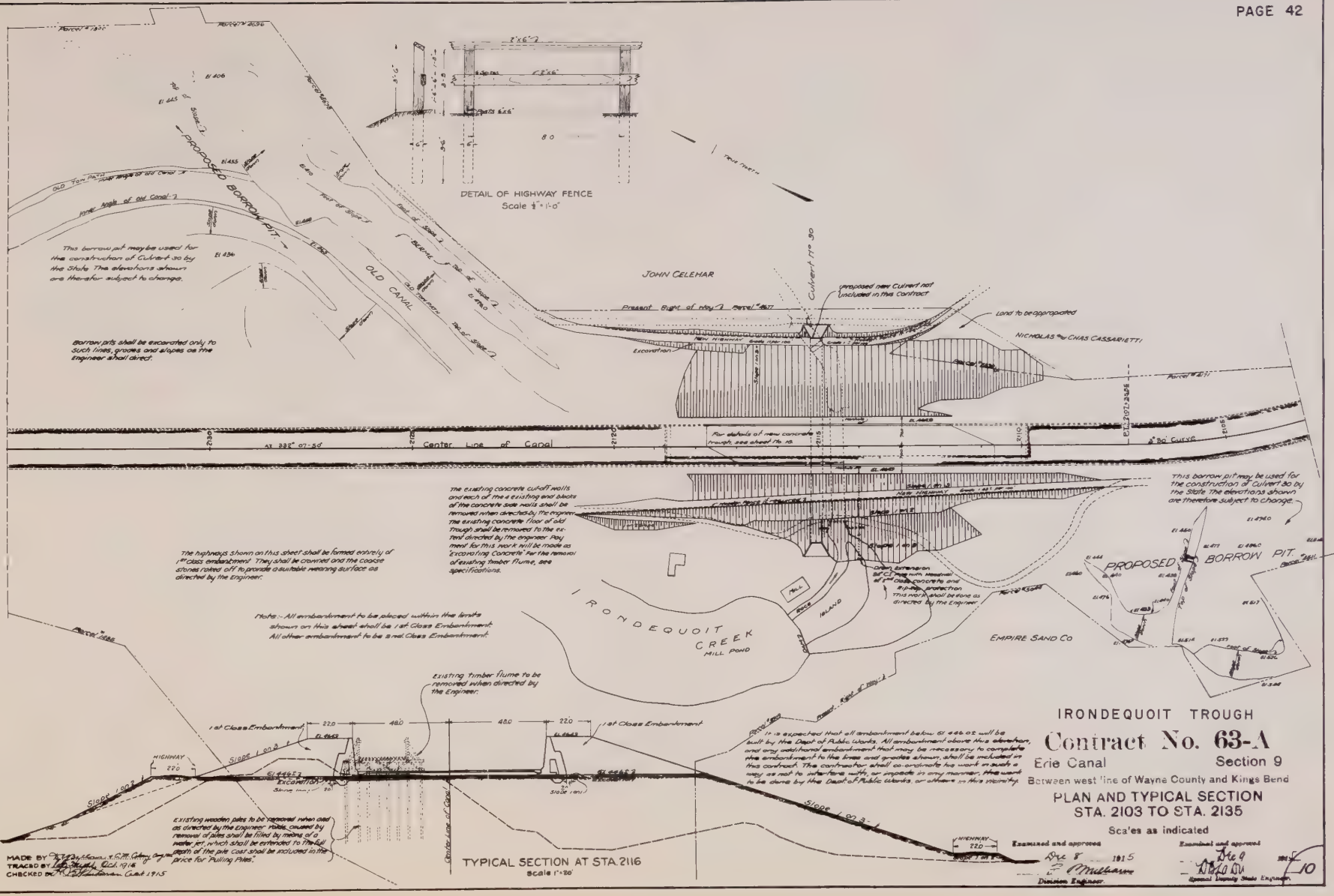
DETAILS OF CHANGES IN PRISM WALLS & FLOOR AT IRONDEQUOIT CREEK EMBANKMENT, STA. 2109 TO STA. 2137+59.33

Scales as indicated

Examined and approved
September 22, 1911.
Alex. E. Kastl
Special Deputy State Engineer

141

MADE BY [illegible] Dept. 1911
TRACED BY [illegible]
1st CHECK BY [illegible]
2nd CHECK BY



IRONDEQUOIT TROUGH

Contract No. 63-A

Erie Canal — Section 9

Between west line of Wayne County and Kings Bend

PLAN AND TYPICAL SECTION STA. 2103 TO STA. 2135

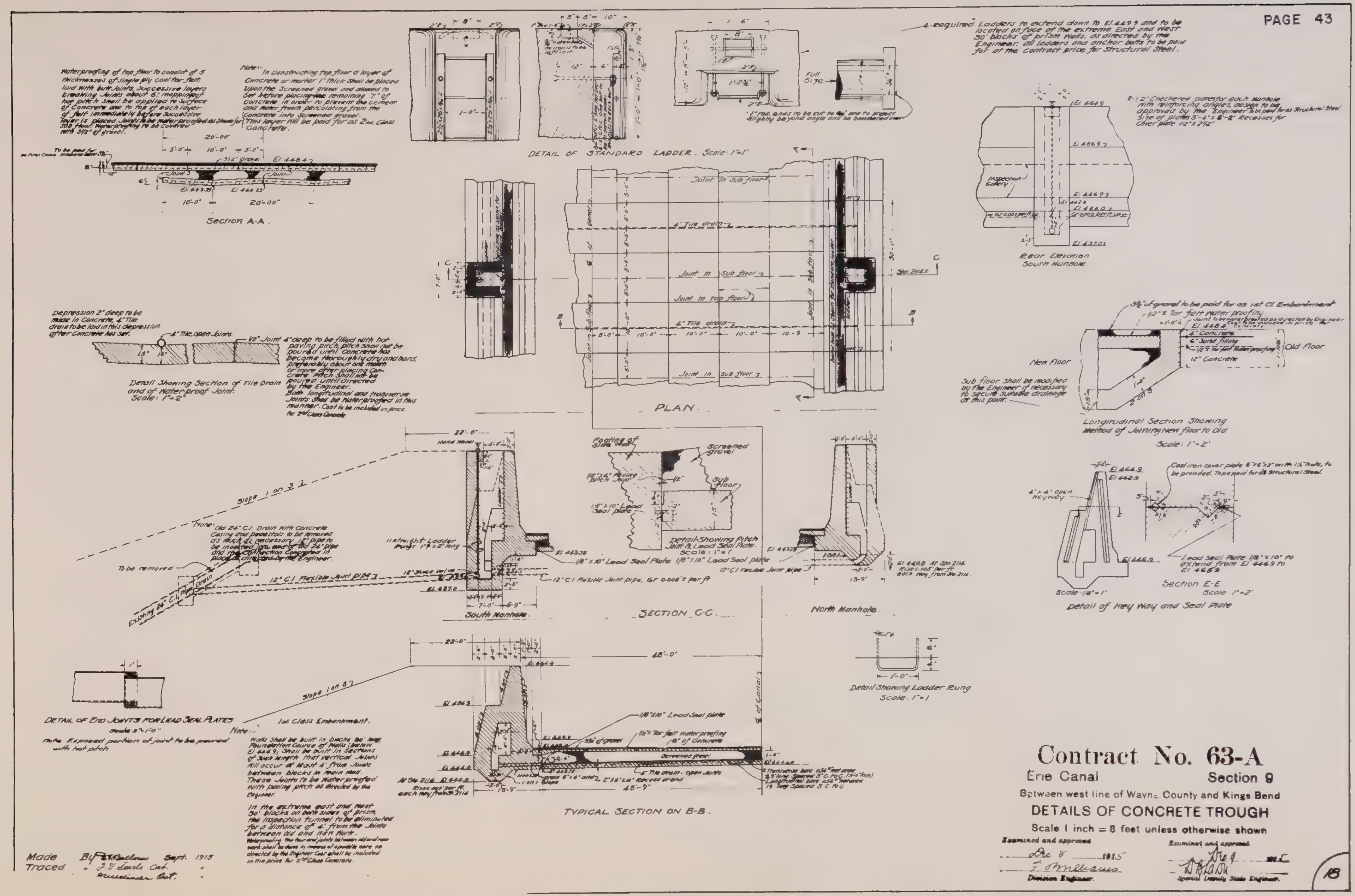
Scales as indicated

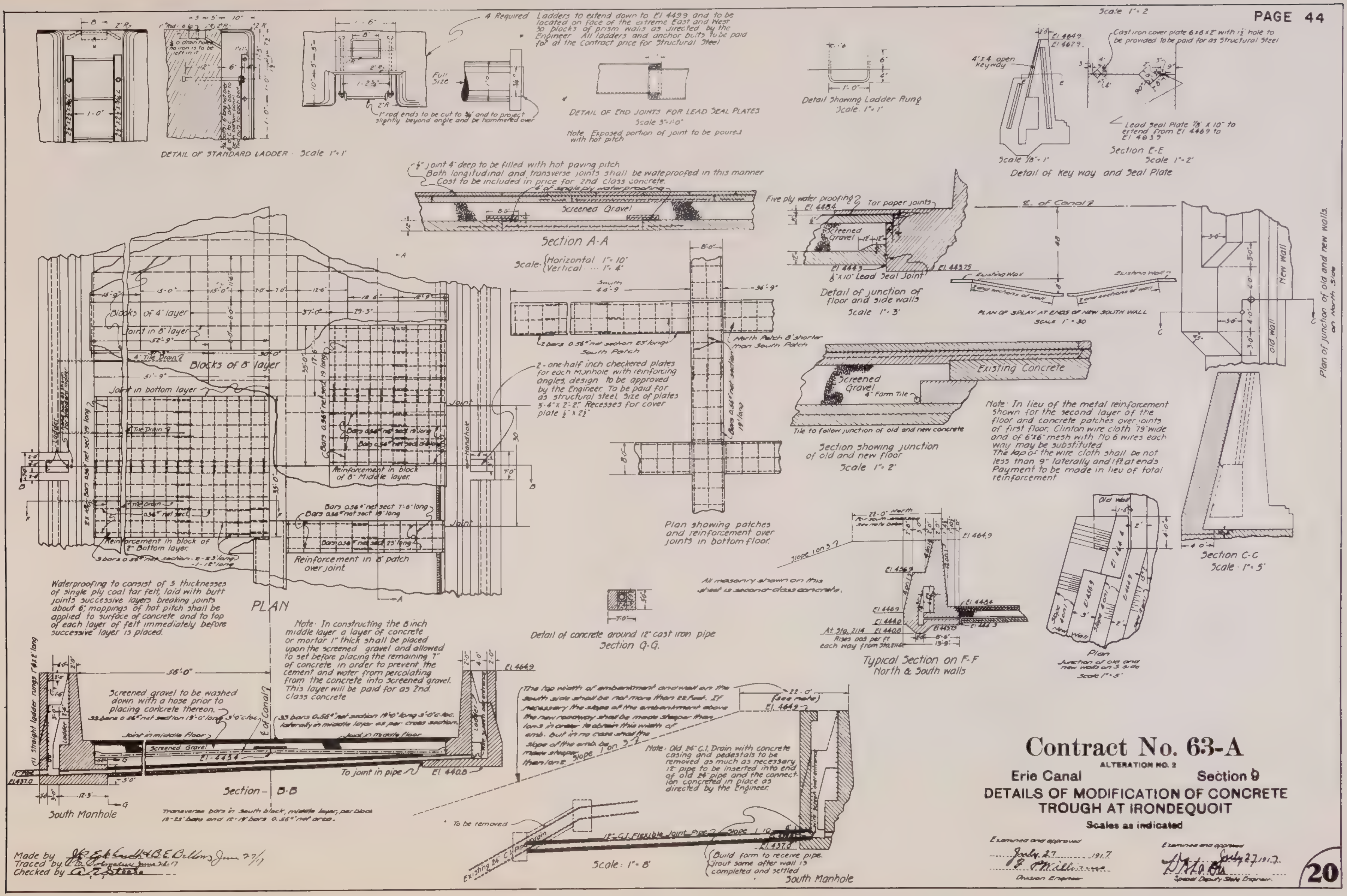
MADE BY [illegible] 1915
TRACED BY [illegible] Oct. 1915
CHECKED BY [illegible] Oct 1915

Examined and approved Dec 8 1915
[illegible]
Division Engineer

Examined and approved Dec 9 1915
[illegible]
Special Deputy State Engineer

10


Waterproofing of top floor to consist of 5 thicknesses of single ply coal tar felt laid with butt joints, successive layers breaking joints about 6" mopping of hot pitch shall be applied to surface of concrete and to top of each layer of felt immediately before successive layer is placed. Joints to be water proofed as shown for sub floor. Waterproofing to be covered with 3½" of gravel.
Note:- In constructing top floor a layer of concrete or mortar 1" thick shall be placed upon the screened gravel and allowed to set before placing the remaining 7" of concrete in order to prevent the cement and water from percolating from the concrete into screened gravel. This layer will be paid for as 2nd Class Concrete.
Section A-A.
DETAIL OF STANDARD LADDER. Scale: 1"=1'
4-Required. Ladders to extend down to El. 446.9 and to be located on face of the extreme East and West 30' blocks of prism walls, as directed by the Engineer. All ladders and anchor bolts to be paid for at the contract price for Structural Steel.
Rear Elevation South Manhole
Depression 2" deep to be made in concrete, 4" Tile drain to be laid in this depression after concrete has set.
Detail Showing Section of Tile Drain and of Waterproof Joint. Scale: 1"=2'
Both longitudinal and transverse joints shall be water proofed in this manner. Cost to be included in price for 2nd Class Concrete.
PLAN.
Longitudinal Section Showing Method of Joining New floor to Old. Scale: 1"=2'
Section C-C.
South Manhole.
North Manhole.
Detail Showing Pitch Joint & Lead Seal Plate. Scale: 1"=1'
Section E-E. Scale: 1"=2'
Detail of Key Way and Seal Plate
Detail Showing Ladder Rung. Scale: 1"=1
DETAIL OF END JOINTS FOR LEAD SEAL PLATES
Note: Exposed portion of joint to be poured with hot pitch
Note:- Walls shall be built in blocks 30' long. Foundation course of walls (below El 446.9) shall be built in sections of such length that vertical joints will occur at least 4' from joints between blocks in main wall. These joints to be water proofed with paving pitch as directed by the Engineer.
In the extreme east and west 30' blocks on both sides of prism, the inspection tunnel to be eliminated for a distance of 4' from the joints between old and new work.
TYPICAL SECTION ON B-B.
Made By F.T. Bellow Sept. 1915
Traced F.V. Searls Oct.
Contract No. 63-A
Erie Canal
Section 9
Between west line of Wayne County and Kings Bend
DETAILS OF CONCRETE TROUGH
Scale 1 inch = 8 feet unless otherwise shown
Examined and approved
Division Engineer.
Examined and approved
Special Deputy State Engineer.
18



DETAIL OF STANDARD LADDER · Scale 1" = 1'
4 Required
Ladders to extend down to El 4499 and to be located on face of the extreme East and West 30 blocks of prism walls as directed by the Engineer. All ladders and anchor bolts to be paid for at the Contract price for Structural Steel
Full Size
1" rod ends to be cut to 3/4" and to project slightly beyond angle and be hammered over
DETAIL OF END JOINTS FOR LEAD SEAL PLATES
Scale 3" = 1'-0"
Note: Exposed portion of joint to be poured with hot pitch
Detail Showing Ladder Rung
Scale 1" = 1'
Cast iron cover plate 6 x 8 x 1/2" with 1 1/2" hole to be provided to be paid for as Structural Steel
4" x 4" open keyway
Lead Seal Plate 1/8" x 10" to extend from El 4469 to El 4639
Section E-E
Scale 1" = 2'
Detail of Key way and Seal Plate
1/2" joint 4" deep to be filled with hot paving pitch
Both longitudinal and transverse joints shall be waterproofed in this manner
Cost to be included in price for 2nd class concrete.
Screened Gravel
Section A-A
Scale: Horizontal 1" = 10' Vertical 1" = 4'
Five ply water proofing
Tar paper joints
Screened Gravel
6" x 10" Lead Seal Joint
Detail of junction of floor and side walls
Scale 1" = 3'
E. of Canal
Existing Wall
PLAN OF SPLAY AT ENDS OF NEW SOUTH WALL
Scale 1" = 30
New Wall
Old Wall
Plan of junction of old and new walls on North Side
Blocks of 4" layer
Joint in 8" layer
Blocks of 8" layer
Joint in bottom layer
Reinforcement in block of 8" Middle layer
Reinforcement in block of 2" Bottom layer
Reinforcement in 8" patch over joint
North Patch 8' shorter than South Patch
South Patch
2 - one-half inch checkered plates for each Manhole with reinforcing angles, design to be approved by the Engineer. To be paid for as structural steel. Size of plates 3'-4" x 2'-2". Recesses for cover plate 1/2" x 2 1/2"
Existing Concrete
Screened Gravel
4" Form Tile
Tile to follow junction of old and new concrete
Section showing junction of old and new floor
Scale 1" = 2'
Note: In lieu of the metal reinforcement shown for the second layer of the floor and concrete patches over joints of first floor, Clinton wire cloth 79" wide and of 6" x 6" mesh with No 6 wires each way may be substituted. The lap of the wire cloth shall be not less than 9" laterally and 1 ft. at ends. Payment to be made in lieu of total reinforcement
Plan showing patches and reinforcement over joints in bottom floor
Section C-C
Scale 1" = 5'
Waterproofing to consist of 5 thicknesses of single ply coal tar felt, laid with butt joints successive layers breaking joints about 6"; moppings of hot pitch shall be applied to surface of concrete and to top of each layer of felt immediately before successive layer is placed.
PLAN
Note: In constructing the 8 inch middle layer a layer of concrete or mortar 1" thick shall be placed upon the screened gravel and allowed to set before placing the remaining 7" of concrete in order to prevent the cement and water from percolating from the concrete into screened gravel. This layer will be paid for as 2nd class concrete
Detail of concrete around 12" cast iron pipe
Section G-G
All masonry shown on this sheet is second-class concrete.
Typical Section on F-F
North & South walls
Plan
Junction of old and new walls on S. side
Scale 1" = 5'
Screened gravel to be washed down with a hose prior to placing concrete thereon.
Section - B-B
South Manhole
All straight ladder rungs 1" dia. long
The top width of embankment and wall on the south side shall be not more than 22 feet. If necessary the slope of the embankment above the new roadway shall be made steeper than 1 on 3 in order to obtain this width of emb. but in no case shall the slope of the emb. be made steeper than 1 on 2.
Note: Old 24" C.I. Drain with concrete casing and pedestals to be removed as much as necessary. 12" pipe to be inserted into end of old 24" pipe and the connection concreted in place as directed by the Engineer.
To be removed
12" C.I. Flexible Joint Pipe
Existing 24" C.I. Pipe Drain
Build form to receive pipe. Grout same after wall is completed and settled
Scale: 1" = 8'
South Manhole
Contract No. 63-A
ALTERATION NO. 2
Erie Canal
Section 9
DETAILS OF MODIFICATION OF CONCRETE TROUGH AT IRONDEQUOIT
Scales as indicated
Made by
Traced by
Checked by
Examined and approved
July 27 1917
Division Engineer
Examined and approved
July 27 1917
Special Deputy State Engineer
20

CARTERSVILLE GUARD GATE COMPLEX

The Cartersville Guard Gate Complex is located approximately 0.5 miles west of the Irondequoit Trough and east of the Village of Pittsford. It is comprised of a guard gate, a waste weir and a waste gate. The guard gate can be lowered to prevent the flow of water should a breach of the canal occur between the Bushnell Basin Guard Gate to the east and Lock 32 to the west. The weir was designed to function as an automatic overflow for any unusually large volumes of water that may enter this canal section. The purpose of the waste gate was to function as a drain. However, due to residential development adjacent to the stream channel and undersize road culverts further downstream, only 1 of the 3 sluice gates can be open at one time and metal angles have been added to the top of the weir to limit overflow.

Guard Gate

The guard gate has the same basic design and dimensions as the Bushnell Basin Guard Gate, except that the south half is founded on bedrock. Two 55 foot wide gates are lifted vertically by counterweights and electric motors.

Shortly after the breach at Bushnell Basin, a temporary sand fill dam was placed across the canal adjacent to the east side of the gate as a result of a bomb threat. This prevented an inspection of about half of the concrete in the guard gate. The evaluation of this structure is based primarily on the condition of its west side and the similar condition of the Bushnell Basin Guard Gate.

The splay wall on the eastern side of the north abutment has

Cartersville Guard Gate, looking east

Sand dam on east side of Cartersville Guard Gate

delaminations over its entire surface area. Core #1 showed this deterioration extended over 14 inches into this wall which is 3 feet thick at the top.

At the south abutment, the top 2 feet of the east splay wall sounded completely delaminated, while the remainder of the wall sounded in somewhat better condition. However, Core #2, taken from this area of the splay wall, revealed that the outermost 3 inches of concrete contained only a few small fracture planes while larger fracture planes existed to a depth of 11 inches into the wall.

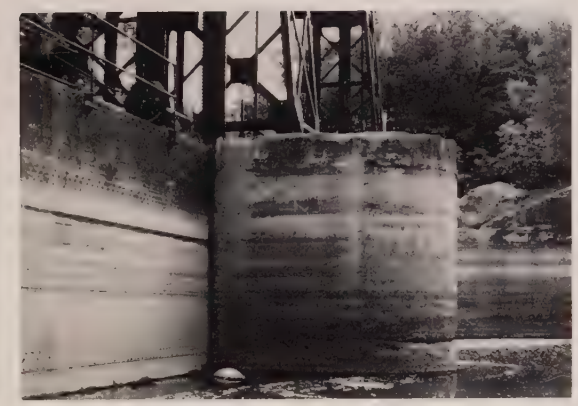
Shortly after the guard gate was built, a now abandoned railroad crossing was constructed just west of this gate. The southwest splay wall was then extended over 200 feet by the railroad abutment and adjacent walls. Next to the gate, the south abutment was found to be only about 5 per cent delaminated along the lower 6 feet. The next short section of splay wall, which angles into the railroad abutment, was found to be approximately 60 per cent delaminated. The two walls under the railroad abutment were found to be only 5 per cent delaminated while the surface area of the end walls averaged about 75 per cent delamination and scaling.

The west section of the north abutment and the adjacent splay wall was sounded and found to be approximately 70 per cent delaminated.

The west half of the center pier contained scaling and delaminations

North east splay wall, Cartersville Guard Gate

South east splay wall, Cartersville Guard Gate



Center pier, north west section, Cartersville Guard Gate

Cartersville Guard Gate, looking east

North abutment, west side, Cartersville Guard Gate

South Abutment and old railroad abutment, Cartersville Guard Gate

over approximately 30 per cent of its lower vertical surface and the top 2 feet of the pier is delaminated. Core #3, taken down through the top of this pier, indicates deterioration over 26 inches deep. The lower portion of this Core #3 had a compressive strength of 4,800 p.s.i.

Waste Weir

The waste weir is 12 feet high and extends 106 feet from the waste gate on the western end to the abutment on the eastern end. Four concrete piers and the two end abutments support steel beams that carry the old tow path across the weir and waste gate. The floor of this bridge is composed of wooden planks.

The east abutment is an extension of the guard gate northwest splay wall. Delamination was detected in 90 per cent of the section on the south or canal side of the weir. Core #1, from this abutment wall, contained deterioration over 11 inches in depth.

The back or canal side of the weir exhibits deterioration and numerous patches over 60 per cent of its surface. A patched section within 5 feet of the east abutment and 5 feet from the top of the weir appeared to contain the most deterioration. Core #2, obtained from this patched section, revealed that deterioration extended into the weir a depth of over 36 inches. The weir is approximately 6 feet thick in this area. A core was also drilled into the opposite side of this weir. This Core # 3 contained deteriorated concrete for a depth of 9.5 inches.

Center pier, south west section, Cartersville Guard Gate

Cartersville Weir, south side

Cores # 4 and #5, also obtained from the canal side of the weir, indicated that additional areas of this weir contain deterioration up to 2 feet in depth. The lower portion of this weir contains the least deteriorated concrete and the top section contains the most. Much of the debris on the canal side of the weir is due to previous repairs made all along its crest.

The front side of the sloping weir face was sounded and found to be approximately 70 per cent delaminated. Core #6, obtained from the only deep scaled area on this face, contained deteriorated concrete to a depth of 12 inches, with an additional 6 inches of concrete previously removed from the face by scaling.

The concrete columns which support the tow path bridge are in very poor condition. Deep scaled areas exist on the lower portions of the columns and numerous cracks and efflorescence exist nearly everywhere else. The pier caps contain only two 1 inch square reinforcing bars while the four columns contain no steel reinforcement.

The section of the east abutment, which extends beyond the weir and supports the east end of the tow path bridge, contained extensive efflorescence. Although the lower half of this wall was sounded and found to contain few areas of delaminations, the upper half contains areas of considerable leakage as indicated by both cracks and discoloration.

The west abutment, which forms part of the wall for the waste gate, initially appeared to be in much better condition, but sounding

North side of Cartersville Weir and pier columns, looking east

East abutment, Cartersville Weir

indicated that delaminations begin approximately 3 feet above the bottom. However, the adjacent section of sloping wall was sounded and was found to be in very good condition. A section of Core # 4 from deep inside the weir had a compressive strength of 5100 p.s.i.

Waste Gate

The waste gate exhibits scaling and delaminations over approximately 40 per cent of its surface area on the south or canal side. Core #1 obtained from the westernmost and least delaminated panel, contained fracture planes 13 inches in depth.

The three stop log columns are generally in poor condition and completely deteriorated as indicated by Core #5. Repairs have been previously made on areas of these columns, but none of the columns contain any large areas of sound concrete.

On the north or front face of the waste gate, the least delaminated wall panel, adjacent to the west abutment, was estimated to be 70 per cent delaminated. All other concrete in the wall and supporting buttresses was 100 per cent delaminated. Cores #2, # 3 and # 4 from the 3 foot thick wall panels contained fracture planes up to 16 inches in depth. Cores # 6 and # 7, from the buttresses showed that they contained fractured concrete throughout their 2 foot thick section. Cores #2 and #3 had compressive strengths of 3,780 and 3,220 p.s.i., respectively.

South side of Cartersville Waste Gate

North side of Cartersville Waste Gate
Note core locations

Conclusions

Guard Gate - Deterioration 1 to 1.5 feet in depth was found on the majority of the north abutment and adjacent walls. The south abutment is in much better condition, but large areas of the splay walls also contain deterioration 1 to 1.5 feet in depth. Except for the pier top which is completely delaminated, center pier deterioration up to 1 foot in depth exists over approximately one half of the vertical concrete.

No immediate repairs are necessary at this time to maintain the stability of the structure. However, future repairs should include replacement of the concrete in the top 2 feet or more of the center pier.

Weir - The east corner of the weir contains deterioration over 3 feet deep. The top half of the canal side contains deterioration up to 2 feet in depth. Some repairs along the top of the weir are still in good condition, but other sections contain delaminated concrete under the repairs. Both abutments probably contain areas of deterioration 1 to 2 feet deep mostly in their upper sections.

No immediate repairs are considered necessary to maintain the stability of the weir. Areas of the weir, such as the crest, the east corner end and adjacent abutment, should be repaired in the near future to prevent possible localized problems.

The piers and pier caps supporting the tow path bridge are in poor condition. The concrete in these piers should be immediately repaired to insure support of this tow path bridge.

North side of Cartersville Weir and pier columns, looking west

South side of Cartersville Weir and Waste Gate

Waste Gate - The center of the waste gate wall contains less than a 1 foot thick section of concrete which does not contain fracture planes. Although the outer sections have begun to deteriorate, the concrete still possesses compressive strength in excess of 3,000 p.s.i. as indicated by Cores # 2 and # 3. Repair of this wall will be required in the near future.

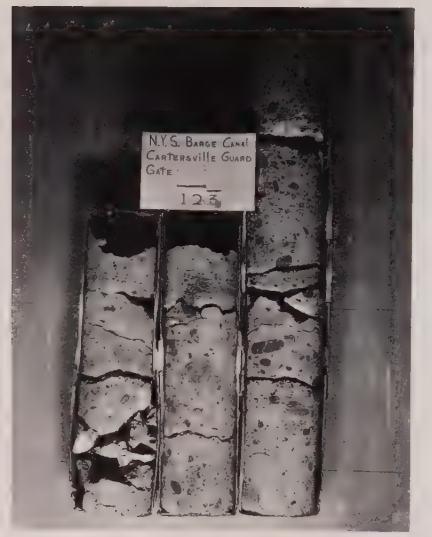
The concrete in the two center buttress walls, which provides support for the waste gate wall, exhibits extensive deterioration. These buttress walls will be removed and replaced prior to the reopening of this canal section. This repair work has been added to Contract M 75-2, presently underway for repair of the breach in the Bushnell Basin Trough.

The concrete in the western abutment and the eastern buttress wall (adjacent to the waste weir) also contains areas of deterioration and will require repair in the near future.

Cartersville Guard Gate, looking west
Sand dam on east side

Coring north side of Cartersville Waste Gate

West Abutment of Cartersville Waste Gate
and Tow Path Bridge



CARTERSVILLE GUARD GATE

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
1	North Abutment, East Splay Wall 2' Below Top	0	14"	0	14"	14"	Deeper deterioration possible.
2	South Abutment, East Splay Wall 6' Below Top	0	11"	0	14"	14"	
3	Top of Center Pier West Section	0	26"	0	26"	26"	Drilled vertically into top of pier, deeper deterioration exists.

CARTERSVILLE WASTE WEIR

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
1	East Abutment, 10' from weir 10' below top	0	11.5	0	13"	13"	
2	South side of weir, 3.5' from east abutment, 4' below crest	0	36"	-	36"	36"	Some breakage at bottom due to retrieval.
3	North side of weir, 4' from east abutment, 6' below crest	0.5*	9.5"	0	19"	19.5"	Opposite Core #2.
4	South side of weir, 28' from east abutment, 4.5' below crest	0	24"	0	35"	35"	
5	70' from east abutment, 5' below crest	0	19.5"	0	24"	24"	
6	North side of weir, 102' from east abutment, 6' below crest	6"	18"	0	14"	20"	Deeper deterioration possible.

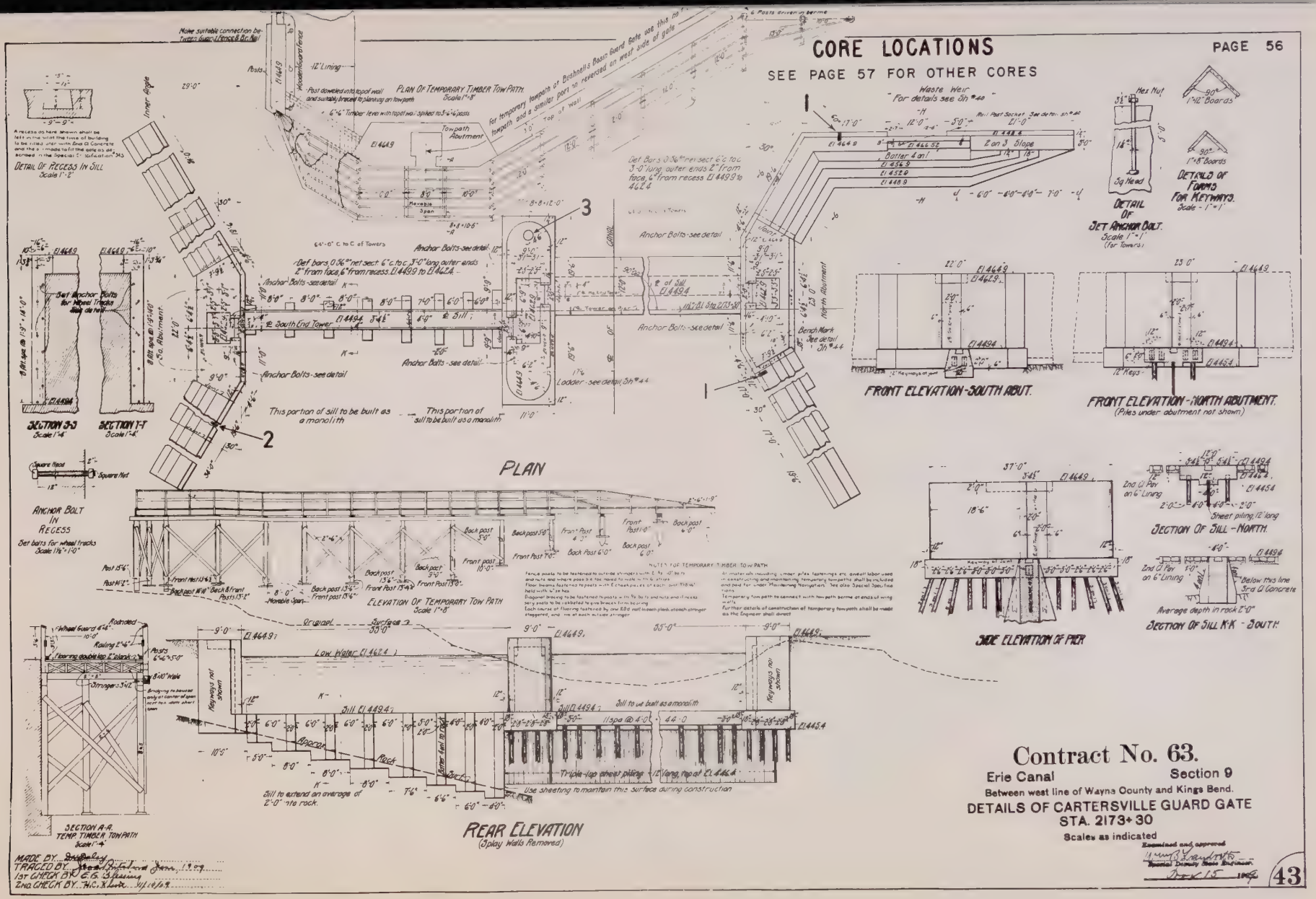
*Data Estimated

CARTERSVILLE WASTE GATE

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
1	South side, west panel, 4' above sluice gate.	0	13"	0	13"	13"	Deeper deterioration possible.
2	North side, west panel, 3' above sluice gate.	0	13.5"	0	13.5"	13.5"	Tiny fracture planes exist.
3	North side, center panel, 3.5' above sluice gate	0	15"	0	15"	15"	
4	North side, west panel, 3' above sluice gate.	0	16"	0	17"	17"	Half way through wall.
5	East stop log column, 7' from top.	3" patch	14"	0	14"	14"	Over half way through column
6	West buttress 1' from gate wall.	0	15.5"	0	15.5"	15.5"	Over half way through buttress.
7	East buttress 3.5' from gate wall.	0	14.5"	0	14.5"	14.5"	Over half way through buttress.

CORE LOCATIONS

SEE PAGE 57 FOR OTHER CORES



Contract No. 63.

Erie Canal — Section 9

Between west line of Wayne County and Kings Bend.

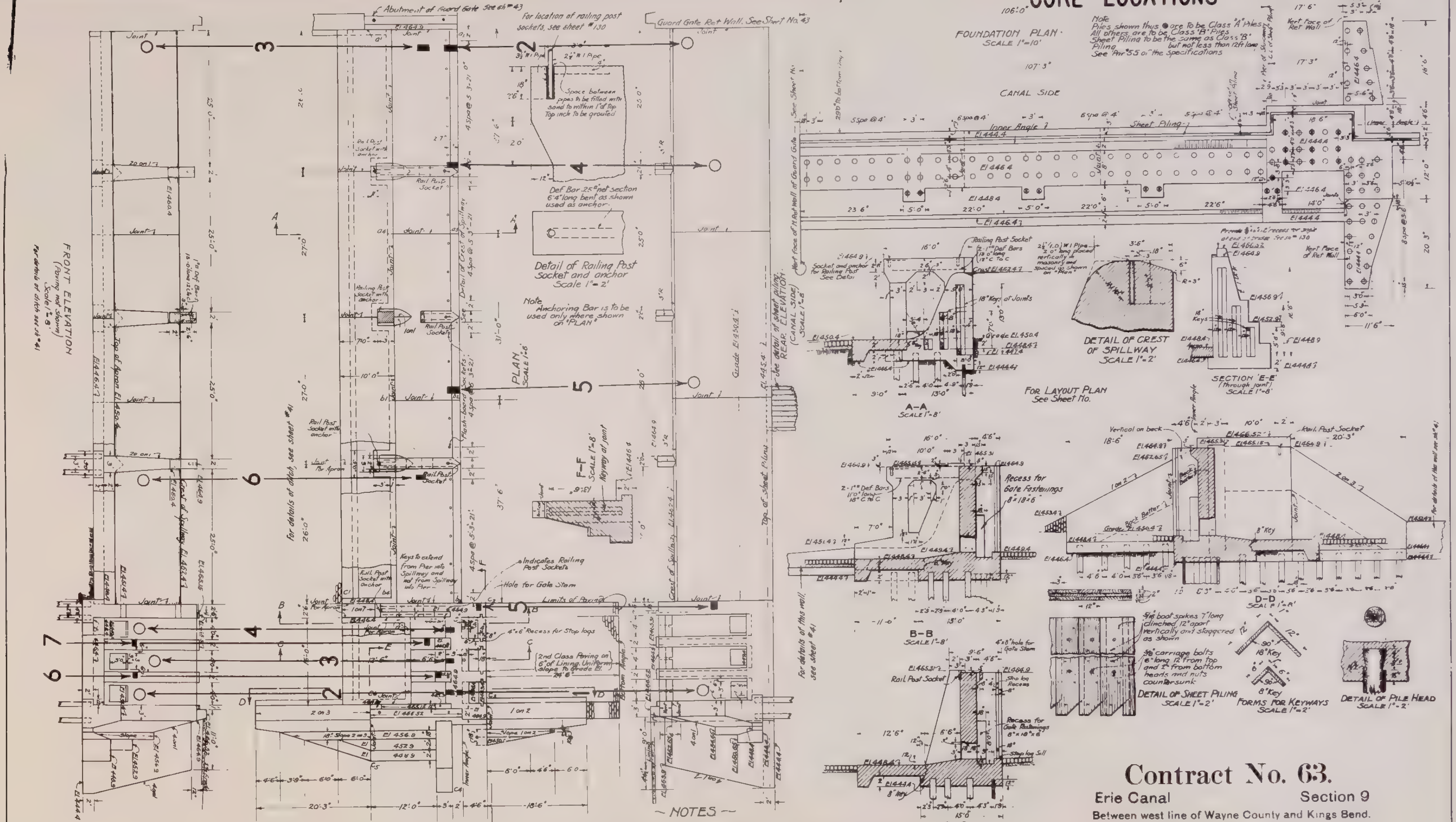
DETAILS OF CARTERSVILLE GUARD GATE

STA. 2173+30

Scales as indicated

MADE BY Jos. Bailey
TRACED BY Wm. Bedford Jan. 1909
1st CHECK BY C.B. Stearns
2nd CHECK BY H.C. Klock 11/16/09

Examined and approved
Assistant Deputy State Engineer.
Dec 15 1909



~ NOTES ~

1- The bases of structures shown on the plans shall be considered as approximate only, and may be ordered by the State Engineer to be at any elevation or of any dimensions necessary to give a proper foundation.
2- Use 2nd Class Concrete throughout.
3- Exposed edges of completed structures are to be rounded to a 3" radius unless shown otherwise. Edges at joints are to be rounded to a ½" radius.
4- The sections a1, a2, a3, a4, a3 a4 b1 b2, b1 b2 b3 b4, and c1 c2---c5 c6, shall be built as monoliths. Work once begun on a section built as a monolith shall be continued without interruption until it is completed.
5- For limits and elevations of 2nd. Class Paving see Layout Sheet No. 41
6- Edges of 2nd. Class Paving are to be protected by a course of stone 18" deep. Payment to be made therefor as 2nd. Class paving.
7- There are to be provided for the Gate Openings shown on this sheet, three 3'x3' rectangular sluice gates with non-rising stem and the necessary standards and operating machinery. The gates are to be operated by hand under a head of 15' and are to be up to the standard of practice of manufacturers of recognized standing.

For details of Bridge over Spillway see sh. #130.

*- Additional details for the proper setting of gates, standards and fastenings will be furnished later and considered a part of this plan.

MADE BY J. H. Freeland 3-'09
TRACED BY Geo. J. Cosgrave Apr. 09.
1st CHECK BY [illegible]
2nd CHECK BY [illegible]

Contract No. 63.

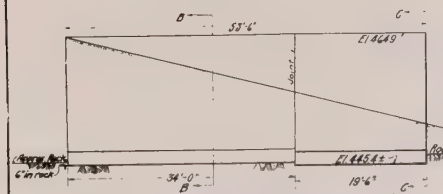
Erie Canal — Section 9

Between west line of Wayne County and Kings Bend.

DETAIL PLANS OF CARTERSVILLE WASTE WEIR

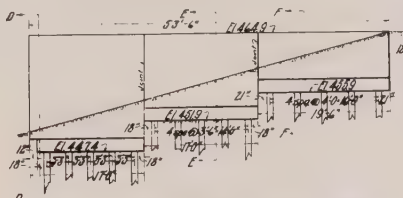
Scales as indicated

Examined and approved
[signature]
Special Deputy State Engineer.
Nov 15 1909

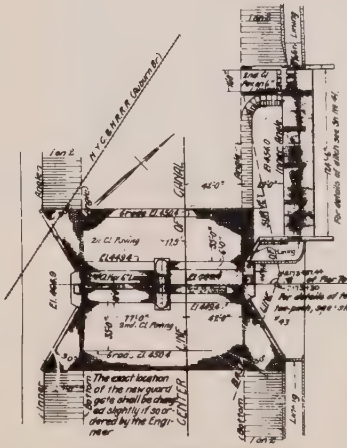


FRONT ELEVATION OF SOUTH EAST 3PLAY WALL.

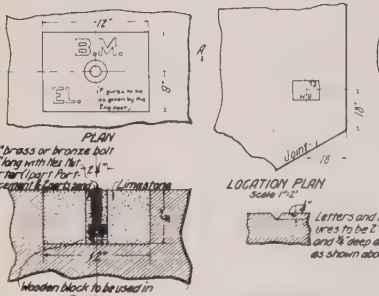
FRONT ELEVATION OF S.W. 3PLAY WALL SAME, BUT OPPOSITE HANDED



FRONT ELEVATION OF NORTH EAST 3PLAY WALL



LAYOUT OF GUARD GATE & WASTE WEIR.
Scale 1"=40'.



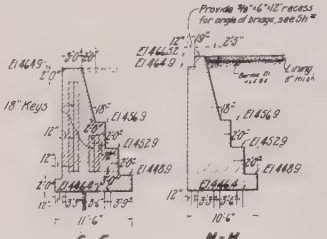
PLAN
1" brass or bronze bolt 5' long with hex nut.
Mortar (1 part Portland cement 2 parts sand)
Limestone
Wooden block to be used in Setting
SECTION A-A
Bolt and stone to be set after completion of masonry.

LOCATION PLAN
Scale 1"=2'
Letters and figures to be 2" high and ¼" deep and cut as shown above

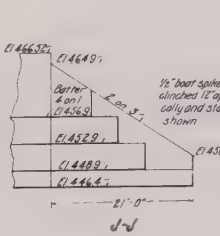
STANDARD BENCH MARK.
Scale 2"=1'

NOTES FOR DETAIL PLANS FOR GUARD GATE.

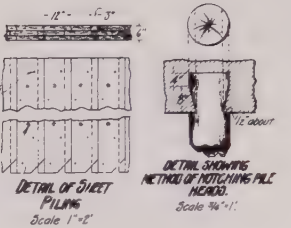
All concrete shall be 2nd. Class except as otherwise shown.
All exposed edges of concrete to be rounded to a 3" radius unless otherwise noted. Edges of joints to be rounded to a ¾" radius.
Sheet piling to be 12 ft. long; see note.
The bases of structures shown on the plans shall be considered as approximate only and may be ordered by the State Engineer to at any elevation or of any dimensions necessary to give a proper foundation.
Whenever concreting on pier or abutments is to be suspended for a period of one hour or more, five keys running crosswise of the wall shall be formed above the last layer of concrete in each structure. These keys shall be not less than 12" high and 2" wide and their ends shall be 1"-6" from faces of finished concrete.
Work once begun on a section to be built as a monolith shall be continued without interruption until the section is completed.
Edges of paving to be protected by a course of stone at least 18" deep. Payment to be made therefor as 2nd. Class Paving
Wing walls to be bonded with longitudinal keys according to the specifications.



G-G H-H



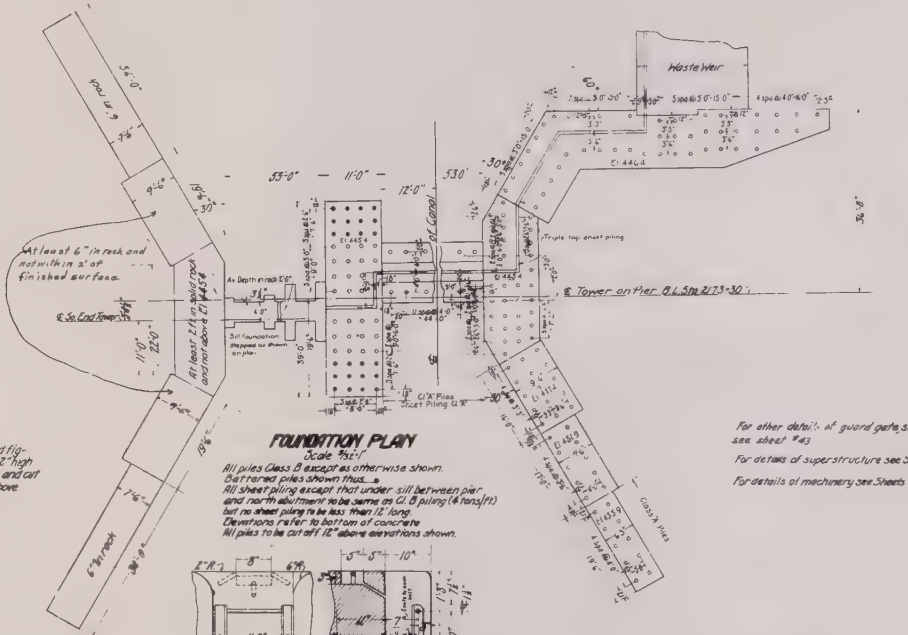
J-J



DETAIL OF SHEET PILING
Scale 1"=2'

DETAIL SHOWING METHOD OF NOTCHING PILE HEADS.
Scale ¾"=1'

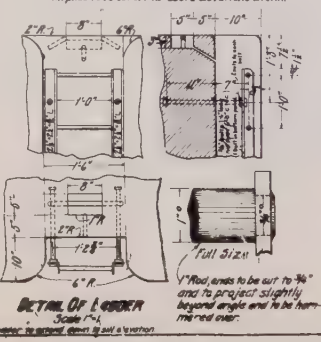
½" boat spikes 7" long clinched 12" apart, vertically and staggered as shown



FOUNDATION PLAN
Scale ¾"=1'

All piles Class B except as otherwise shown.
Battered piles shown thus....
All sheet piling except that under sill between pier and north abutment to be same as Cl. B piling (4 tons/ft) but no sheet piling to be less than 12' long.
Elevations refer to bottom of concrete
All piles to be cut off 12" above elevations shown.

For other details of guard gate, substructure see sheet #43
For details of superstructure see Sheets #132 to #134
For details of mechinery see Sheets #135 to #137.



DETAIL OF LADDER
Scale 1"=1'
Ladder to extend down to sill elevation

Full Size
½" Rod, ends to be cut to ¾" and to project slightly beyond angle and to be hammered over.

Contract No. 63.

Erie Canal — Section 9

Between west line of Wayne County and Kings Bend.

DETAILS OF CARTERSVILLE GUARD GATE STA. 2173+30

Scales as Indicated

Examined and approved
Wayne Woodworth
Nov 15 1909

Traced by [illegible]
Detailed by E.G. Pickering
Final check by H.C. Klein 11/9/09

44

LOCK 32

Lock 32, with a lift of 25.1 feet, is located in the Town of Pittsford adjacent to the Route 65 (Clover Street) Bridge over the Barge Canal. It is 2.8 miles west of the Cartersville Guard Gate Complex and 1.3 miles east of Lock 33. The lock consists of a lock chamber, upper and lower guide walls, spillway and by-pass channel, by-pass tunnel, operating machinery (both electric and manual) and other associated structures. All concrete footings are pile supported and the higher embankments are lined with sheet piling.

The lock chamber has a 4 foot thick concrete floor. It is 336 feet long, 45 feet wide at the bottom, tapers to a 49 foot width at the top, and has a total depth of 42.5 feet. Lock walls are 5 feet thick at the top and step down to a 25 foot thickness at the bottom. Each lock wall contains a 7 foot wide by 9 foot high main culvert which runs from the upper pool to the lower pool along the lower section of the wall. Nine 3.5 foot square ports connect the lock chamber with the culvert. Valves at each end of the main culvert enable the lock chamber water elevation to be raised or lowered.

A separate 5 foot wide by 7 foot high by-pass culvert is also contained in the south lock wall. This culvert, which is over 900 feet in length, extends between the far end of the upper (western) guide wall to almost the end of the lower (eastern) guide wall. A valve can be opened in this by-pass culvert to permit an additional flow of water around the lock.

Lock 32 chamber, looking east

East approach area, note Route 65 bridge overhead

The upper guide wall has a length of 345 feet. Although the sections vary, it generally has a height of 25 feet and a top width of 4 feet which steps down to a bottom width of 14 feet to accommodate the by-pass culvert. The lower guide wall has a length of 313 feet, a height of 18.5 feet, and a top width of 4 feet which steps down to a 20 foot width at the bottom. The cross configuration of the lower guide wall varies considerably from one end to the other.

The spillway is designed to release unusually large volumes of water which enter the upper pool. It is 50 feet wide, 140 feet long, including tailrace, and 25 feet high. Concrete blocks, embedded in the 1 vertical to 2 horizontal sloped spillway, help dissipate the force of the water before it enters the stream channel which bypasses the lock.

Under Contract M62-5, 13 years ago, portions of both lock chamber walls and the upper sill of the lock chamber were refaced with up to 4 inches of shotcrete.

The north lock chamber wall presently contains scaling, cracks and delaminated concrete on over 90 per cent of its surface. Of the 13 wall panels between the gates, 11 have deterioration over all of their surface area and 2 panels have deterioration over approximately one half of their surface. Overall, an estimated 30 per cent of this north lock wall was refaced with shotcrete. Areas of shotcrete range from none on 4 panels to approximately 80 per cent on the panel adjacent to the west gate. The 7 cores obtained from this wall (Cores # 6-12) revealed that deterioration

West guide wall, south side of lock

North lock wall, core holes 9, 10, and 11, from left to right

North lock wall, core holes 6, 7, and 8, from left to right

North lock wall, middle section

South lock wall, core holes 19 and 18, from left to right

South lock wall, core hole 14 and 13, from left to right

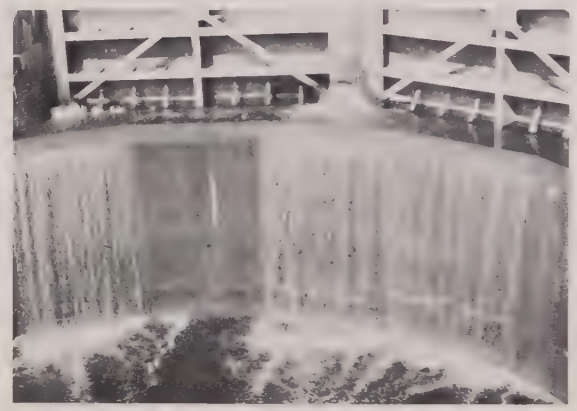
generally extended from 6 to 12 inches in depth into the wall. Core #9 had a compressive strength of 5620 p.s.i.

The south lock chamber wall has scaling, cracks and delaminated concrete over an estimated 50 per cent of its surface. Of the 13 panels, 4 show deterioration over most of their surface, 7 exhibit deterioration on one-half of their area, and 2 show little or no deterioration. Approximately 80 per cent of the south lock chamber wall has been refaced with shotcrete, which was 3 to 4 inches in thickness as noted in the cores. The 7 cores from this wall (Cores #13-19) showed that deterioration generally ranged from 6 to 18 inches in depth. Core #15 had a compressive strength of 6,940 p.s.i.

The concrete sill below the west gate has been completely refaced with shotcrete. Many cracks exist in this shotcrete as denoted by the discoloration. Core #4, from a center area of the sill, showed that 3 inches of deteriorated concrete exists behind the 3 inches of shotcrete. The lower portion of this core had a compressive strength of 5,730 p.s.i.

Extensive scaling and delaminations cover an estimated 90 per cent of the upper guide wall surface. Core #1, taken from this concrete wall under the no longer used buffer beam, contained 18 inches of deteriorated concrete. In addition, the outermost 4 inches of the original concrete in this core location has been eroded from the surface by scaling.

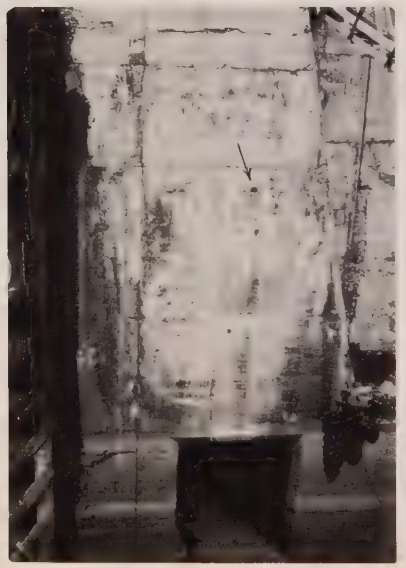
South lock wall, core hole 15



Sill under west lock gate, note core hole 4

North east guide wall and Route 65 bridge

South lock wall, core holes 17 and 16 from left to right



North main culvert discharge, note core hole 5

South main culvert discharge

Adjacent to the upper gates are the entrances to the main culverts. Concrete in this vicinity is extensively scaled and delaminated. Core #2, from over the south entrance and Core #3, from over the north entrance revealed that deteriorated concrete exists to a depth of 13 to 16 inches. The nondeteriorated portion of Core #3 had a compressive strength of 6780 p.s.i.

Both lock walls extend a short distance beyond the lower gates to provide support for the gates. At the bottom of these sections are the exits for the main culverts. The concrete on the surface of these walls is extensively cracked and discolored. Core #5, from the north side, showed that this deterioration exists to 8 inches in depth.

Deterioration inside the main culverts is very limited. Scaling up to 5 inches deep was noted in a few areas of the floor and lower culvert walls. Ground water leaks through the vertical construction joints when the lock is empty of water and some of these joint edges are scaled. Delaminated concrete was detected near the lock ends of the ports, but few areas of delaminated concrete were detected in the culverts. Overall, the main culverts, except for the entrance areas adjacent to the upper gates, are presently in good condition.

Extensive concrete deterioration was noted around the area of the eastern buffer beam on the lower guide wall. Overall, the surface area of the lower guide wall was estimated to be 50 per cent scaled

Trash racks of main culvert intake, south side note core hole 2

East guide wall and buffer beam

and delaminated. The major portion of this deterioration is on the upper section of the wall. A pedestrian bridge at the east end of the lower guide wall is severely deteriorated with the reinforcing steel completely exposed.

The by-pass culvert exits behind the lower guide wall. The majority of the internal sections of this culvert are lined with concrete, while irregular shaped sections are brick lined. Although the lower section of this culvert could not be internally inspected, the construction joints were estimated to be open as much as 1/2 inch and leak considerably when under a head of water.

The upper section of this culvert, which is located inside the upper guide wall, was internally inspected. The construction joints in this section were much tighter than those in the lower section. However, ground water does leak through all these joints and some erosion has occurred along the joint edges. Since most of this culvert is either filled with water or protected from the weather, little deterioration of the concrete lining has occurred. The only crack noted in the culvert was at the west end near the entrance where the culvert rounds a corner. This crack was about 1/2 inch wide and extended nearly all around the culvert. A similar type crack was also noted in the same area of the by-pass culvert in Lock 33. No problems were visually associated with these cracks.

Considerable deterioration also existed in the concrete surrounding the large trash racks at the by-pass culvert entrance.

East guide wall and bypass tunnel outlet

North west guide wall showing upper main culvert intake and buffer beam recess

The by-pass spillway, located next to the by-pass culvert entrance, is where wood planks or stop logs can be inserted between the short columns at the crest to vary the water level of the canal. Both the concrete spillway pad below the crest and the approach pad were estimated to be 50 per cent delaminated. The 12 foot high concrete wall under the crest of the spillway is pile supported and protected with sheet piling. Therefore, the surface deterioration on the pads, which are 2 feet thick and steel reinforced, presently has little effect on this structure. Localized repairs, however, have been made and will continue to be necessary to that concrete along the crest of the spillway.

By-pass tunnel intake and crest of spillway, looking east

Conclusion

At the present time, no areas of this lock require immediate repair.

Although large sections of the lock chamber walls have been refaced with shotcrete, concrete deterioration behind the shotcrete has prevented a good bond with the original concrete. Some areas of shotcrete have already fallen off the walls and other sections, which are extremely loose, may fall at any time. Deterioration in the north lock chamber wall and the upper sill was found to extend 1 foot in depth or less from the original surface. In the south lock chamber wall, deterioration was found to be 1.5 feet or less in depth.

The appearance of the lock chamber walls before refacing with shotcrete was probably very similar to the present appearance of the guide walls outside the chamber. Due to the thickness of these

By-pass spillway tailrace

massive walls, the majority of the deterioration existing at this lock is considered to be a surface condition which detracts only from the esthetic value of the structure. Other areas of deeper deterioration exist near the buffer beams, at culvert entrances and, undoubtedly, in many other small isolated areas which can only be located as future repairs are made.

Open joints in culvert areas should be filled to help prevent further deterioration. Since the lock floor is always under water and protected from weathering, we conclude that it is in good condition.

The only serious condition noted at this lock was the pedestrian bridge at the east end of the lower guide wall. Although only a secondary structure, which does not effect the operation of the lock, this bridge should be removed or barricaded.

Lock 32 has been designated as a canal park and many visitors use the picnic areas and other facilities. The esthetic value of this lock would be greatly enhanced by repair of the surface deterioration.

Lock 32 chamber, looking west

Buffer beam and guide wall, west end

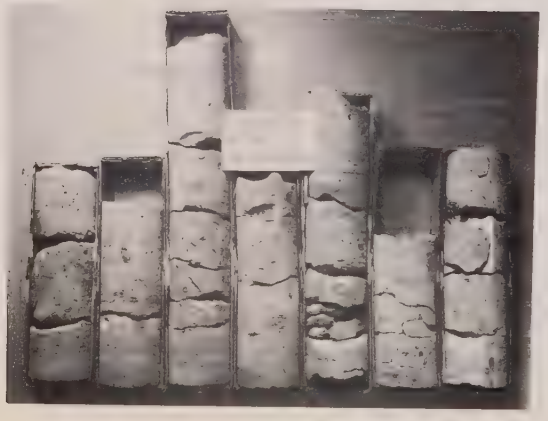
LOCK 32 CORES

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
1	South guide wall 7' from top of wall	4"*	22"	0	31"	35"	Taken below buffer beam
2	South wall, 3' above culvert entrance	2"*	16"	0	14"	16"	
3	North wall, 3.5' above culvert culvert entrance	2"	13"	1 @ 16.5"	21"	23"	
4	West sill, 3" shotcrete, 12' below top of sill	3"	6"	0	13.5"	13.5"	
5	North wall 11' from top of wall	0	8"	0	13"	13"	

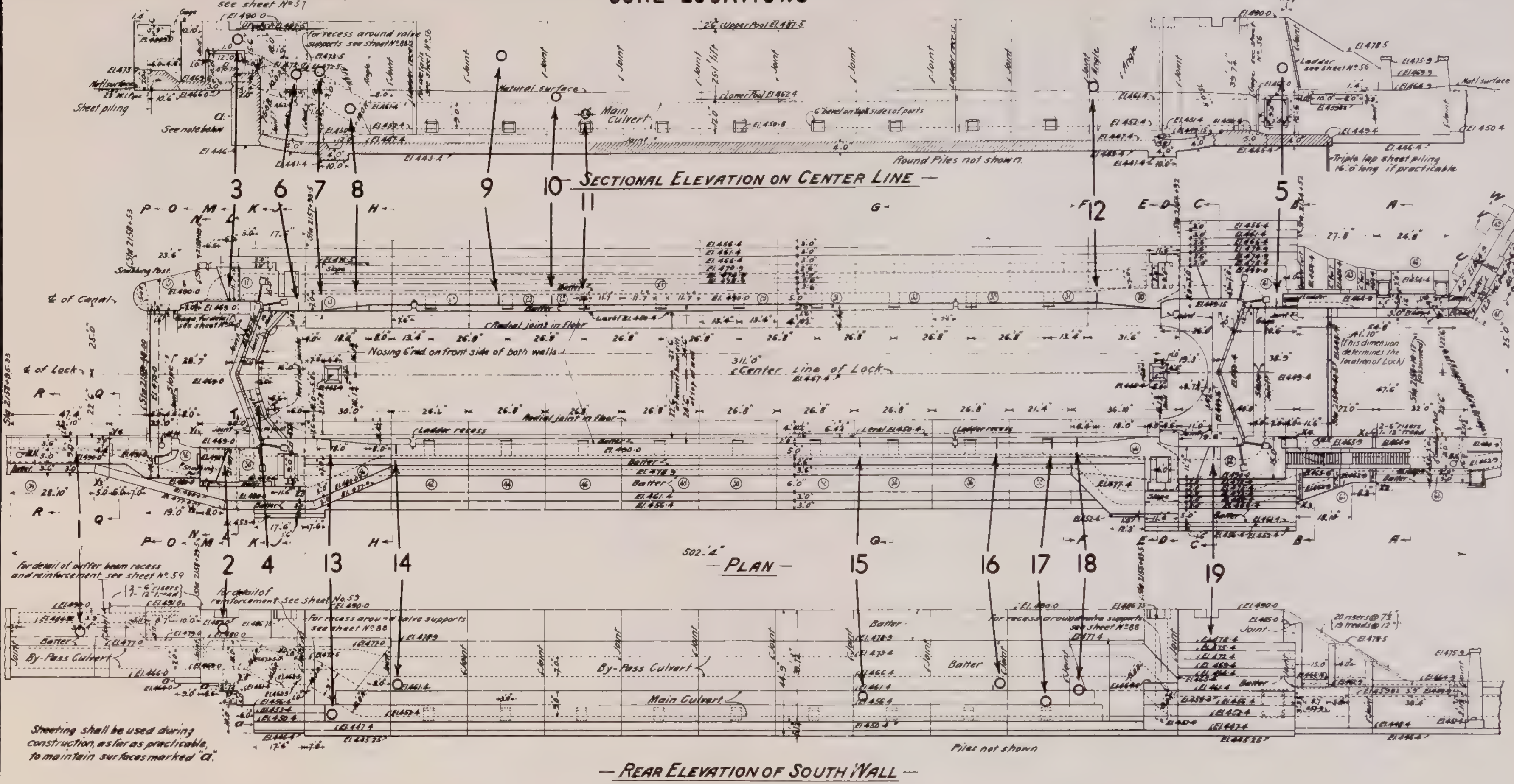
*Data Estimated

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
6	North lock chamber wall, 20' from top of wall	2"	11"	1 @ 10"	14"	16"	
7	North lock chamber wall, 10' from top of wall	2.5" shotcrete	8"	0	12.5"	12.5"	
8	North lock chamber wall, 29' from top of wall	0-4" shotcrete	12"	0	12"	12"	Deeper deterioration possible.
9	North lock chamber wall, 15' from top of wall	2"	8.5"	0	14"	16"	
10	North lock chamber wall, 25' from top of wall	0	10"	0	14"	14"	
11	North lock chamber wall, 1' above port	0	11.5"	0	14"	14"	
12	North lock chamber wall, 24' from top of wall	1"	6"	1 @ 9.5"	13"	14"	

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
13	South lock chamber wall, 5' above bottom	3" shotcrete	14"	0	14"	14"	Deeper deterioration exists.
14	South lock chamber wall, 27' from top of wall	3" shotcrete	12"	0	12"	12"	Deeper deterioration possible.
15	South lock chamber wall, 29' from top of wall	3.5 shotcrete	16.5"	0	22.5"	22.5"	
16	South lock chamber wall, 25' from top of wall	4" shotcrete	14.5"	0	14.5"	14.5"	Deeper deterioration possible.
17	South lock chamber wall, 2' above 9th port	1"	19"	0	18"	19"	Next to port opening.
18	South lock chamber wall, 28' from top of wall	0"	6"	0	9.5"	9.5"	
19	South lock chamber wall, 12' from top of wall	0"	10"	0	15"	15"	



CORE LOCATIONS



The following sections shall each be built as a monolith, and work once begun thereon shall be continued without interruption until the section is completed viz:-

Side wall between limits of X_1, X_2, X_3 & X_4	from El. 457.9	to El. 465.9
" " " " Y_1, Y_2, Y_3 & Y_4	" El. 480.0	to El. 491.0
Both thrust walls bet. Stas. 2154+52 & 2154+92	" El. 484.0	to El. 490.0
" " " " 2157+93.5 & 2158+29.5	" El. 484.0	to El. 490.0

Spaces under and around masonry shall be backfilled, where so required, with material placed as specified for forming embankment.

The floor shall be built in sections with dividing lines at right angles to center line of lock. Each section shall be built as a monolith.

The bases of structures shown on any of the plans of this contract shall be considered as approximate only, and may be ordered by the State Engineer in writing to be at any elevation and of any dimensions necessary to give a proper foundation.

For directions relating to modification of foundations see sheet Nº 30.

For detailed dimensions of Lock ends see sheet Nºs 33 & 34.

Top of Lock walls to be crowned ⅜ inch. Top edges of all walls are to be rounded to a radius of 2" unless otherwise shown.

For reinforcement of toe of chamber walls, and lower thrust walls, see sheet Nºs 32 & 58.

MADE BY O. F. Ballou 3 08
TRACED BY J. N. Lloyd 4-22-08
1ST CHECK BY Underhill
2ND CHECK BY

Contract No. 23.

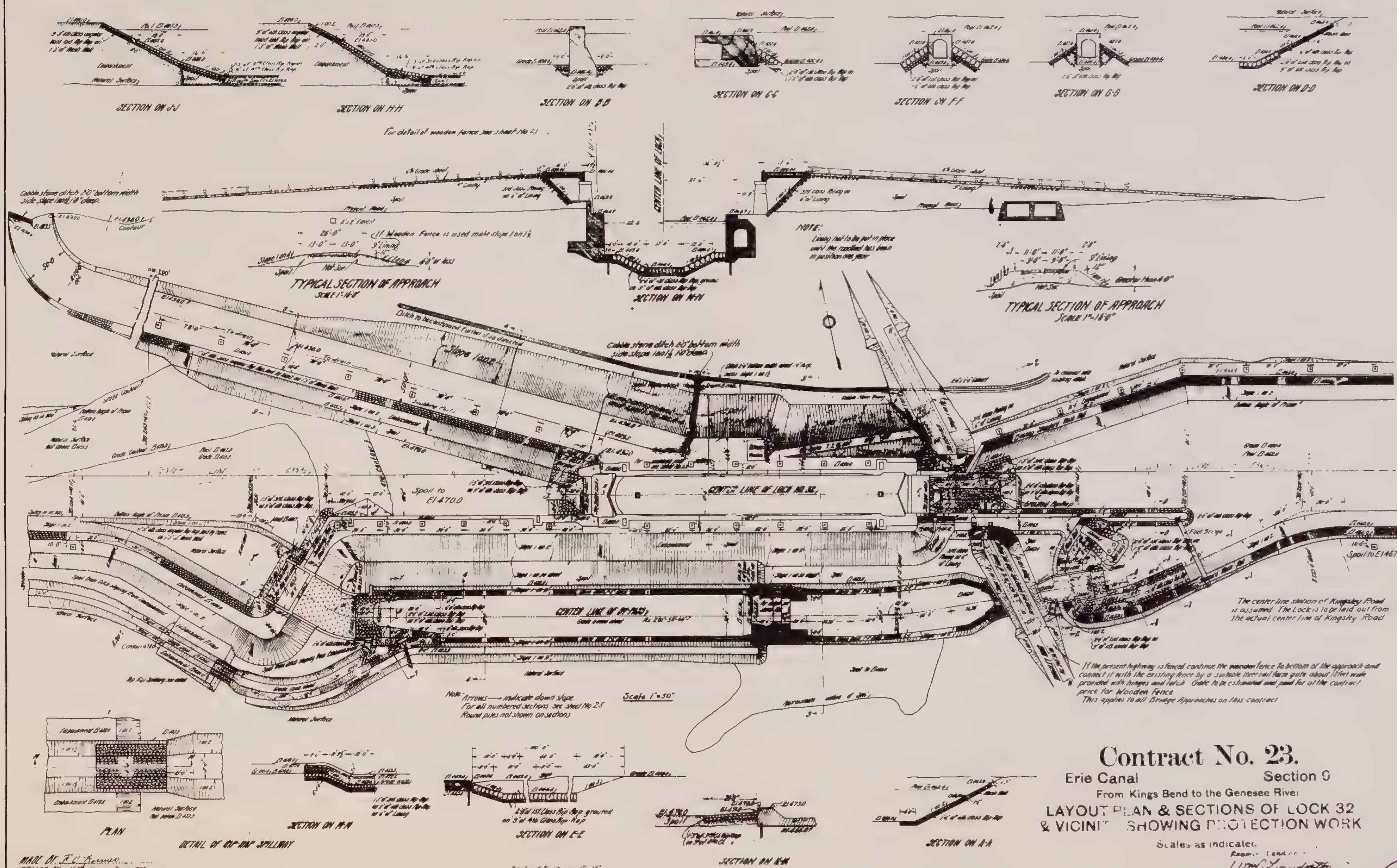
Erie Canal Section 9.

From Kings Bern… to the Genesee River.

PLAN & ELEVATION OF LOCK 32

Scale: 16 feet to [illegible]

Examined and approved
Wm. B. Landreth
State Engineer



Contract No. 23.

Erie Canal Section 9

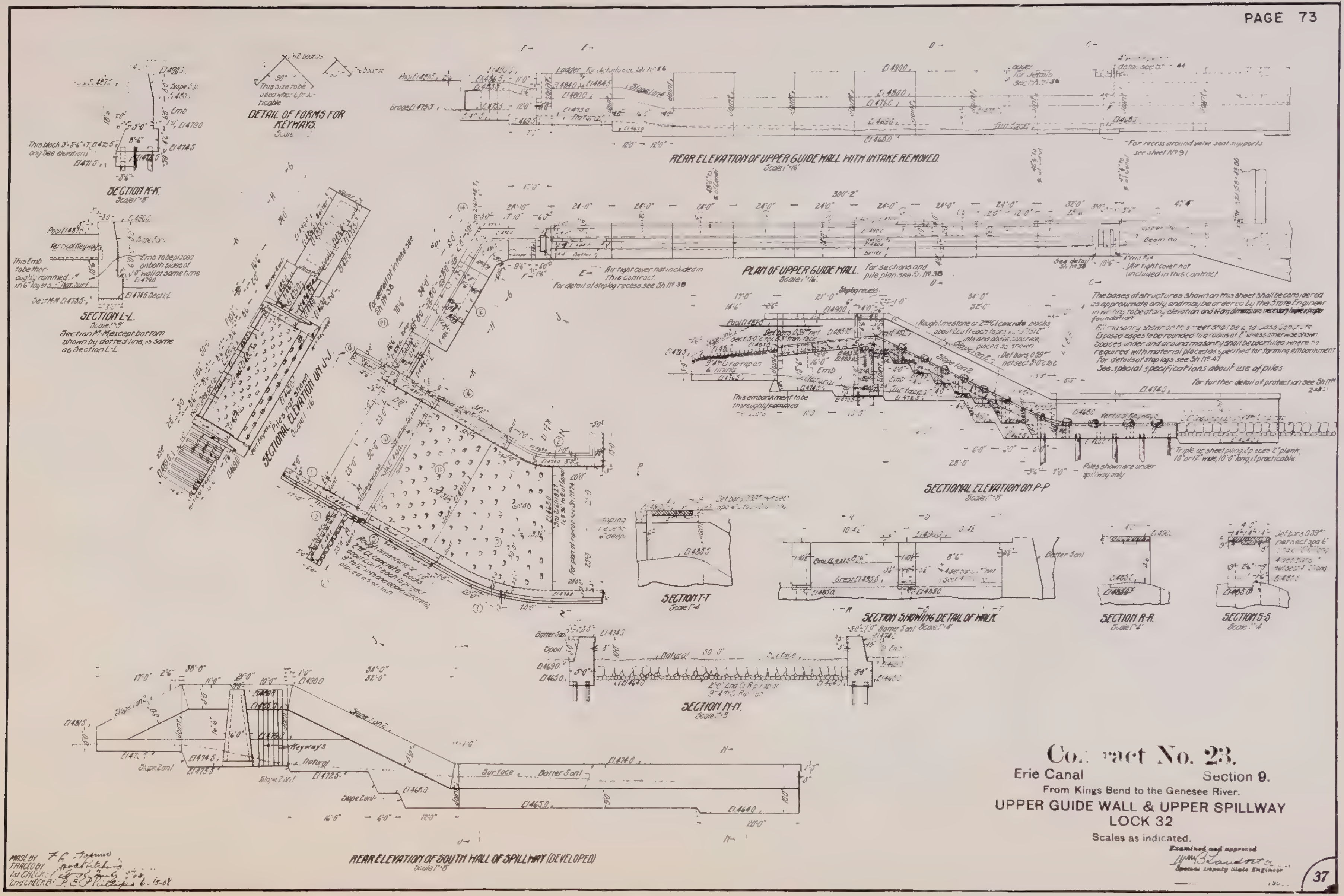
From Kings Bend to the Genesee River

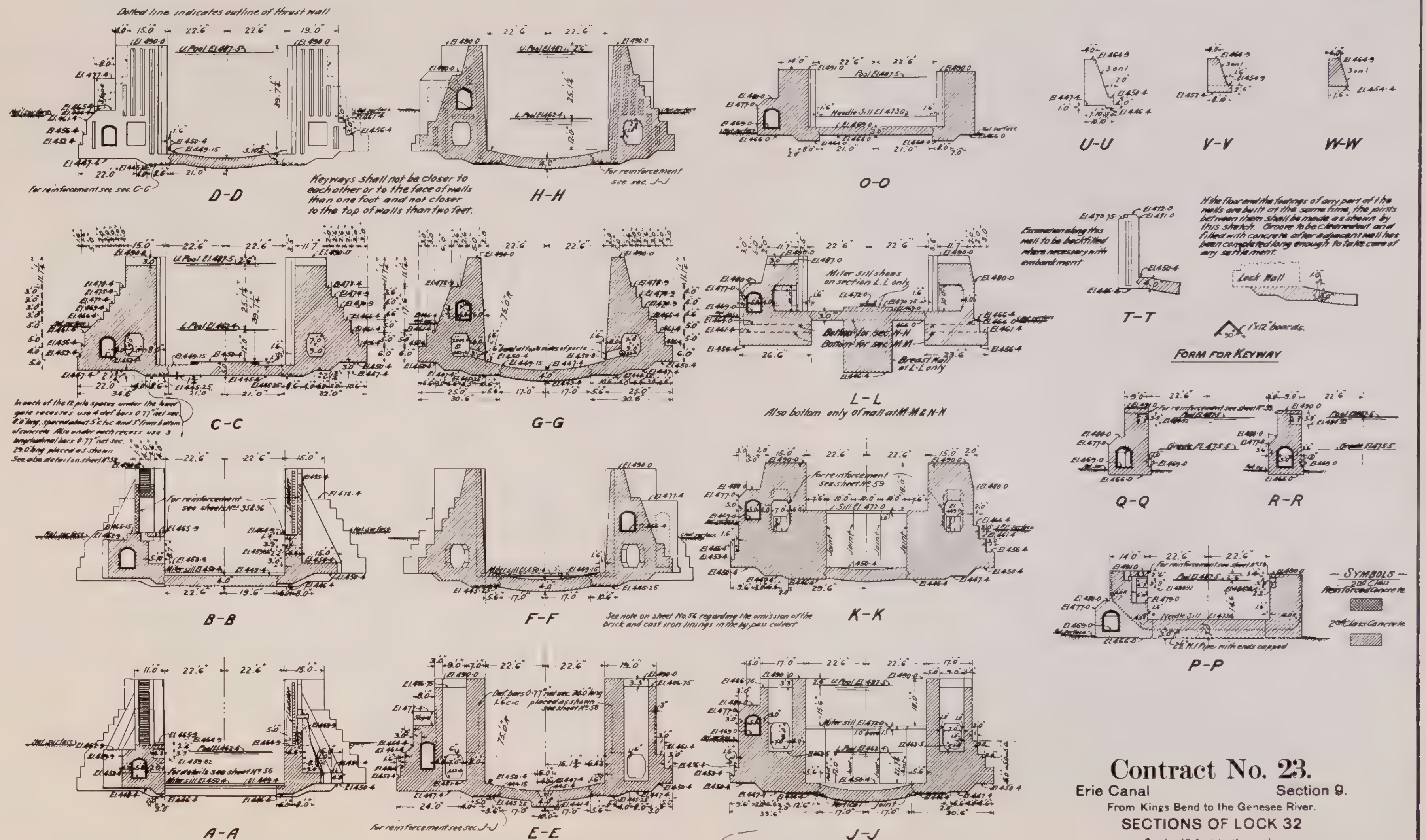
LAYOUT PLAN & SECTIONS OF LOCK 32 & VICINITY SHOWING PROTECTION WORK

Scales as indicated

Wm. C. Landreth

MADE BY F. C. Kerrven
TRACED BY
1st CHECK BY
2nd CHECK BY R. C. Phillips 6-08


SECTION K-K.
DETAIL OF FORMS FOR KEYWAYS.
REAR ELEVATION OF UPPER GUIDE WALL WITH INTAKE REMOVED.
SECTION L-L.
Section M-M except bottom shown by dotted line, is same as Section L-L
PLAN OF UPPER GUIDE WALL.
SECTIONAL ELEVATION ON J-J.
SECTIONAL ELEVATION ON P-P
The bases of structures shown on this sheet shall be considered as approximate only, and may be ordered by the State Engineer
See special specifications about use of piles
SECTION T-T
SECTION SHOWING DETAIL OF WALK.
SECTION R-R.
SECTION S-S
SECTION N-N.
REAR ELEVATION OF SOUTH WALL OF SPILLWAY (DEVELOPED)
Contract No. 23.
Erie Canal
Section 9.
From Kings Bend to the Genesee River.
UPPER GUIDE WALL & UPPER SPILLWAY
LOCK 32
Scales as indicated.
Examined and approved
Special Deputy State Engineer
37



Contract No. 23.

Erie Canal — Section 9.

From Kings Bend to the Genesee River.

SECTIONS OF LOCK 32

Scale: 18 feet to the inch.

Examined and approved

Special Deputy State Engineer

MADE BY O. F. Bollew 3-08
TRACED BY J. N. Long 3-21-08
1ST CHECK BY Underhill 4/08
2ND CHECK BY Geo. R. Rudy 7/08

Masonry shown on this sheet shall be second class concrete except where otherwise shown as reinforced concrete.
Top of lock walls to be crowned ⅛ inch

Top edges of all walls are to be rounded to a radius of 2 inches unless otherwise shown.
For directions relating to modification of foundations see sheet Nº 30
For additional notes see Lock Drawing Sheet Nº 31

In each pile space under toe of chamber wall from the lower gate recess to angle at breast wall use 4 def. bars 0.77" net section 10.0' long spaced about 6" c. to c. and 3" from bottom of concrete, also place three rows of bars 0.77" net section with ends lapped not less than 3.0' spaced as shown. See also detail on sheet Nº 58

LOCK 33

Lock 33 is located on the Brighton-Henrietta Town Line adjacent to the Edgewood Avenue Bridge over the Barge Canal. It is 1.3 miles west of Lock 32 and 4.1 miles from the Genesee River which provides the water for this section of the canal. This lock is identical to Lock 32 in design and dimensions, except for a small powerhouse next to the by-pass spillway. This powerhouse is presently used as a storage facility.

The north lock chamber wall contains deterioration over nearly all of its surface. Cores #12-21 revealed that this deterioration generally extends from 5 to 14 inches in depth from the original surface. Three of these cores (#13, 14, and 15) were taken from areas of deep scale below the top of the wall, near vertical construction joints, where the concrete surface appeared to be continuously wet. These cores showed that deteriorated concrete extends into the wall for a depth of up to 2 feet in the vicinity of these joints. Groundwater appears to be slowly seeping through these joints, as was also noted in the lock culverts, and staining the wall as it drains into the lock. Core #17 had a compressive strength of 6,300 p.s.i.

The south lock chamber wall has scaling and delamination over an estimated 60 per cent of its surface. Cores #7, 8, 10 and 11 contained deteriorated concrete from 5 to 14 inches in depth. Soundings along the lower 6 feet of this wall indicated that portions of these wall sections were in relatively good condition. Core #9, which was taken in one of these good sections, contained no deterioration and had a compressive strength of 6930 p.s.i.

Lock chamber, looking east

Coring north lock wall from "Snooper"

Areas of the upper sill below the west gate have been previously repaired with concrete. The original concrete around the repairs was extensively scaled and delaminated, but no delaminations were detected under the repairs. Cores #5 and 6 were taken from the sill in areas which contained extensive scaling. Five to 6 inches of the original concrete has eroded from the surface in these areas. An additional 10 to 12 inches of deteriorated concrete was present in these cores. A nondeteriorated portion of Core #6 had a compressive strength of 5630 p.s.i.

The upper guide wall has delamination and deep scaling over nearly all of its surface. Cores #1 and 2 were taken in this wall from locations approximately 200 feet west of the upper gate. Core #1, from an area of deep scaling, showed that deterioration extends 16 inches in from the original surface. Core #2, from an adjacent area which appeared to be in better condition, contained deterioration 7 inches in depth. The lower portion of Core #2 had a compressive strength of 5390 p.s.i.

In the vicinity of the entrances of the main culverts, adjacent to the upper gates, the concrete is extensively scaled and delaminated similar to the condition found in Lock 32. Core #3, from over the south entrance, revealed that deterioration in this area extended over 4 feet into the wall. This deep deterioration most likely resulted from drainage down through the floor of the machinery pits located directly above this core location. Core #4, from the same area on the north wall, contained deterioration only 17 inches in depth.

Sill under west lock gate, core holes 5 and 6, right to left

West guide wall; white building in background is the powerhouse

South main culvert intake and trash racks, note core hole 3

West guide wall and buffer beam

North main culvert intake and trash racks, north west approach wall, note core hole 4

East guide wall and buffer beam

Above the exits of the main culverts, adjacent to the lower gate, the concrete surface is extensively cracked and discolored. On the north wall side, the top 3 feet has been recently repaired. Core #24, from the center of this wall below the repaired area, contained deterioration 10 inches in depth. Cores #25 and 26 were taken from the adjacent retaining wall, where the center area had deteriorated to 6 inches in depth and a corner area had deteriorated to over 10 inches in depth. Core #27, taken from the retaining wall on the south side of the lock under the concrete stairs, contained 12 inches of deterioration.

The condition of the main and by-pass culverts in Lock 33 is very similar to the condition observed in Lock 32. Two cores were obtained from the main culvert in the north lock chamber wall. Core #22 was taken in one of the few hollow sounding areas found on these culvert walls. It was located adjacent to a 1 foot x 6 foot long area that had scaled 3 to 4 inches in depth. The core revealed deterioration 12 inches in depth. Core #23, taken from a 3 inch scaled area of the floor in this same area, contained only 1 inch of further deterioration.

The lower guide wall is extensively scaled and deteriorated around the area of the east buffer beam. Similar deterioration exists around the area of the west buffer beam and both buffer beams at Lock 32. Overall, the lower guide wall was estimated to be 50 per cent scaled and delaminated with the major portion of the deterioration located on the upper section of the wall. An old pedestrian bridge at the east end of this wall is severely

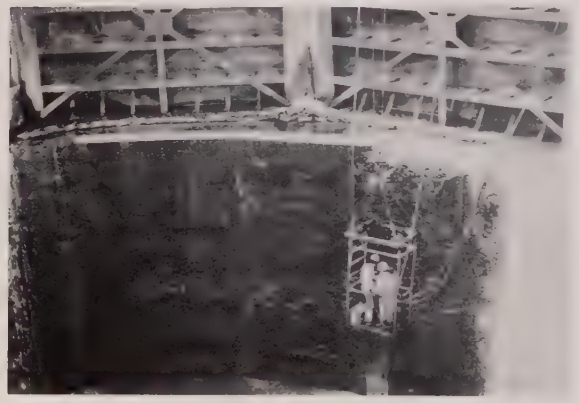
North east approach wall, core holes 25 and 26, left to right

East guide wall, looking south

North lock wall, core holes 16 and 17, left to right

North lock wall, core holes 20 and 21, left to right

Overall view of south lock wall



Coring sill under west lock gate

deteriorated with its reinforcing steel completely exposed.

Considerable deterioration also exists in the concrete surrounding the large trash racks at the by-pass culvert entrance.

The by-pass spillway at this lock is the same design as the one at Lock 32, but some differences were noted. A few years after construction of Lock 33, a wall of steel sheet piling was placed on the canal side, 40 feet from the spillway crest. A short concrete wall was then built on top of this steel sheet piling. The existing approach pad area between this wall and the crest was then covered with 6 to 12 inches of concrete. This work was done in 1918 to provide additional protection for this area. Approximately 10 years ago, the short columns at the spillway crest were replaced. A new railing and aluminum grating, walkway bridge were also added.

Some areas of the approach and spillway pads are delaminated, and a number of the protruding concrete blocks on the spillway pad, which act as energy dissipators, are either missing or loose. Areas of scaling and cracking were noted on isolated wall sections. This deterioration, however, has little effect on the function of this structure.

One minor problem, associated with this spillway, is the slow leakage of water recently noted at the bottom of the spillway pad when the canal is nearly full. This leakage has no effect on the function of the lock. The exact path of this water could not be determined. However, some of the possibilities are that the water could be flowing through the delaminated concrete pads, passing through a crack in a sheet piling wall or the concrete wall under the crest, or even flowing under the concrete pads.

Bypass tunnel intake, powerhouse intake, and spillway crest, left to right

Spillway tailrace and powerhouse discharge

Conclusion

No areas of this lock require immediate repair at the present time. Nearly all of the north lock chamber wall is extensively scaled or delaminated. Cores showed that deteriorated concrete ranges from 5 to 14 inches in depth from the original surface and up to 2 feet or more in joint areas where leakage was noted.

The south lock chamber wall is in better condition than the north, but cores showed that deterioration up to 14 inches in depth exists on over one half of this wall. Many delaminated areas of concrete on both walls are extremely loose and may fall from the wall at any time. Due to the thickness of these massive walls, the majority of the noted deterioration is a surface condition which detracts only from the esthetic value of the structure. Areas of deeper deterioration exist near the buffer beams, at the culvert entrances (especially the area over the south main culvert entrance) and, undoubtedly, in many other small isolated areas which can only be located as future repairs are made.

Open joints in the culverts should be filled to help prevent further deterioration.

The edge of the lock floor around the bottom of the chamber walls was inspected and no scaling or delaminations were detected. Since the lock floor is always under water and protected from weathering, we conclude that the remainder of the floor is also in good condition.

The leakage at the bottom of the spillway pad is minimal and the

Lock chamber, looking west

South east approach wall, note core hole 27 under stairs

water is clear. Since the water flows back into the lower pool of the canal, this leakage presently causes no problems. However, it should be watched and, if the flow increases, measures should be taken to alleviate this leak.

The only serious condition noted at this lock was the pedestrian bridge located at the east end of the lower guide wall. Although only a secondary structure, which has no effect on the operation of the lock, this bridge should be removed or barricaded.

Pedestrian bridge and east guide wall, as seen from spillway discharge channel

West guide wall and bypass tunnel intake, note vertical crack in wall, center

East guide wall, north side

LOCK 33 CORES

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
1	Upper guide wall 10' from top of wall	7"	15.5"	0	13.5"	20.5"	
2	Upper guide wall 11' from top of wall	0	6.5"	0	13.5"	13.5"	
3	South wall behind upper gate, 3' above culvert entrance	9.5"	51.5"	-	42"	51.5"	Some breakage at end of core due to retrieval.
4	North wall behind upper gate, 3' above culvert entrance	5.5"	17"	1 @ 22"	21.5"	27"	

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
5	West sill 12' below top of sill	6"	16"	0	16"	22"	Deeper deterioration possible.
6	West sill 12' below top of sill	5"	17"	0	12"	17"	Deeper deterioration possible.
7	South lock chamber wall, 21' from top of wall	4.5"	13.5"	1 @ 16"	14.5"	19"	
8	South lock chamber wall, 3' above bottom	0	4.5"	0	13.5"	13.5"	Top of core was lost.
9	South lock chamber wall, 16' from top of wall	0	0	0	13.5"	13.5"	
10	South lock chamber wall, 10' from top of wall	0	9"	0	12.5"	12.5"	
11	South lock chamber wall, 3' above bottom	0	6.5"	0	11.5"	11.5"	

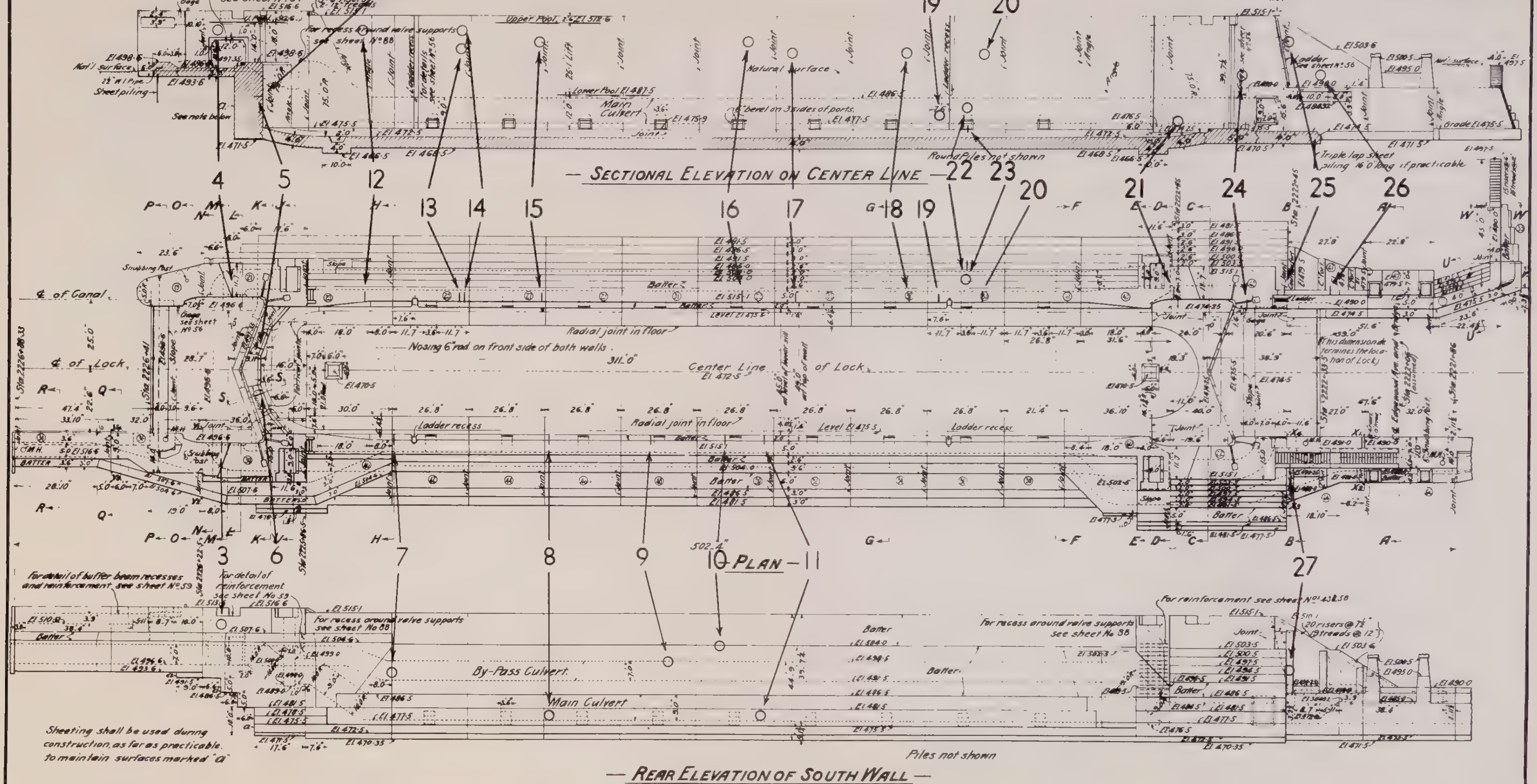
Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
12	North lock chamber wall, 5' below top of wall	3"	14"	1 @ 22"	22"	25"	Drill water came out of wall 3' from core hole.
13	North lock chamber wall, 9' below top of wall	5.5"	22.5"	0	17"	22.5"	Deeper deterioration exists.
14	North lock chamber wall, 3' below top of wall	3"	22.5"	0	30"	33"	Pieces of core lost.
15	North lock chamber wall, 10' below top of wall	5"	21"	0	17"	22"	Drill water came out of wall below core hole.
16	North lock chamber wall, 8' below top of wall	4"	13.5"	0	15"	19"	

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
17	North lock chamber wall, 15' below top of wall	0	4.5"	0	15"	15"	
18	North lock chamber wall, 16' below top of wall	0	7.5"	0	13"	13"	
19	North lock chamber wall, 4' above bottom	1"*	8.5"	0	8.5"	8.5"	Drill problems. Deeper deterioration exists.
20	North lock chamber wall, 17' below top of wall	0	5"	0	15"	15"	
21	North lock chamber wall, 4' above bottom	0	10"	1 @ 8.5"	14"	14"	
22	North main culvert 4' above floor	0	12"	0	15"	15"	
23	North main culvert middle of floor	3"	4"	1 @ 5" 1 @ 12"	13"	16"	

*Data estimated.

Core Number	Location	Scaled Depth	Deteriorated Depth	Intentional Breaks	Recovered Depth	Total Depth	Comments
24	North wall east of lower gate, 20' from top	0	9.5"	0	13"	13"	
25	North retaining wall east of lower gate 13' above bottom	4"	10"	0	10"	14"	Drill problems. Deeper deterioration exists.
26	North retaining wall east of lower gate 4' above bottom	0	6"	0	9"	9"	
27	South retaining wall below stairs, 5' above bottom	0	12"	0	13"	13"	

CORE LOCATIONS



The following sections shall each be built as a monolith, and work once begun thereon shall be continued without interruption until the section is completed viz:-

Side wall between limits of X_1, X_2, X_3 & X_4	from El 483·0	to El 491·0
" " " " Y_1, Y_2, Y_3 & Y_4	El 504·6	to El 516·6
Both thrust walls bet. Stas. 2222+45 & 2222+85	El 509·1	to El 515·1
" " " " 2225+86.5 & 2226+22.5	El 510·6	to El 516·6

Spaces under and around masonry shall be backfilled, where so required, with material placed as specified for forming embankment.

The floor shall be built in sections with dividing lines at right angles to center line of Lock. Each section shall be built as a monolith.

The bases of structures shown on any of the plans of this contract shall be considered as approximate only, and may be ordered by the State Engineer in writing to be at any elevation and of any dimensions necessary to give a proper foundation.

For directions relating to modification of foundations see sheet Nº 41

For detailed dimensions of Lock ends see sheet Nos 44 & 45

Top of Lock walls to be crowned ⅛ inch

Top edges of all walls are to be rounded to a radius of 2" unless otherwise shown.

For reinforcement of toe of chamber walls, and lower thrust walls, see sheet Nos 43 & 58

MADE BY O. F. Bellows 4-08
TRACED BY J. A. Lange 3-30-08
1ST CHECK BY [signature] 4-08
2ND CHECK BY Underhill [illegible]

Contract No. 23.

Erie Canal — Section 9.

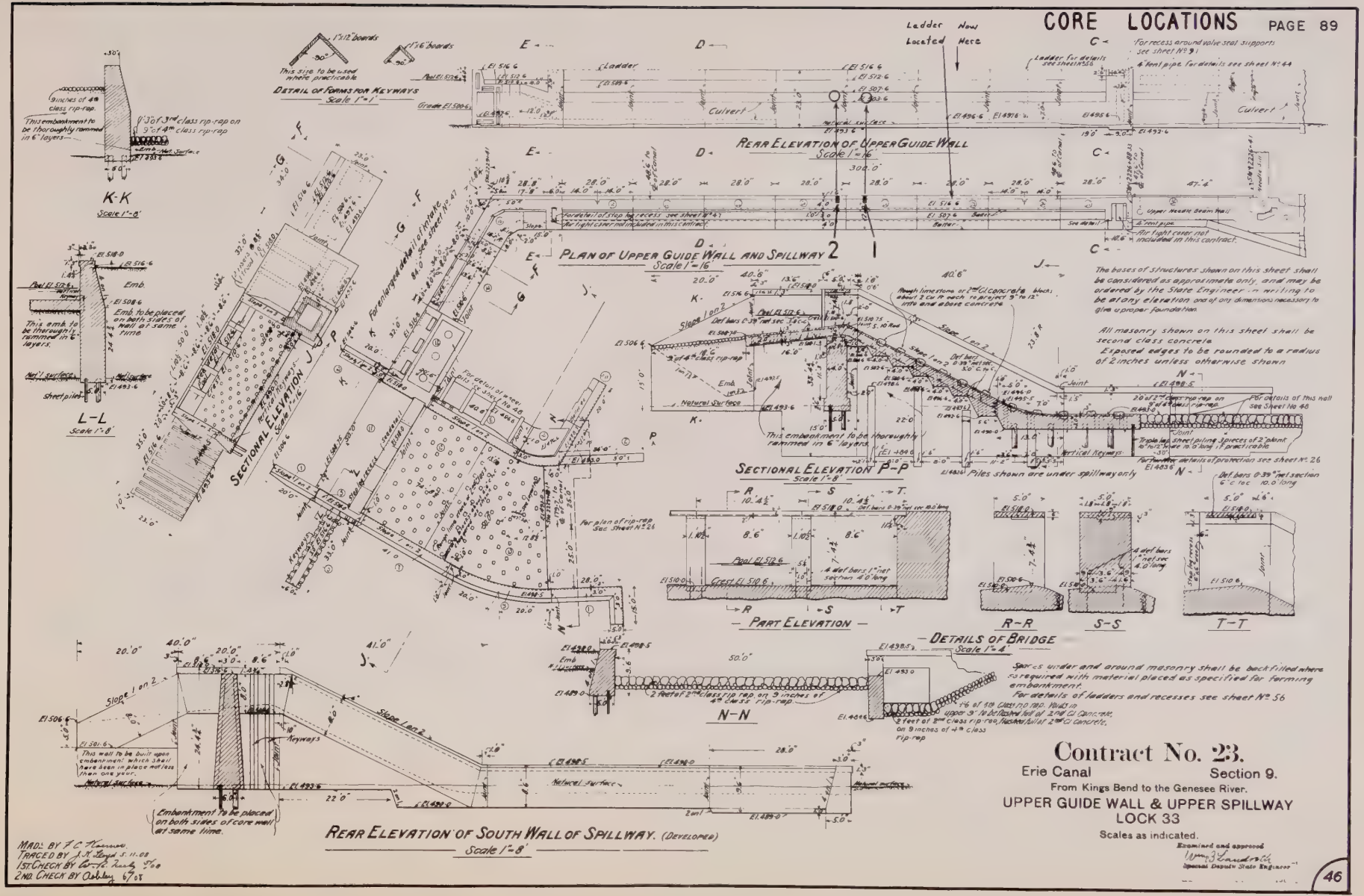
From Kings Bend to the Genesee River.

PLAN & ELEVATION OF LOCK 33

Scale: 15 feet to the inch

Examined and approved
Wm B Landreth
[illegible] Engineer.

—, 20—



Contract No. 23.

Erie Canal Section 9.

From Kings Bend to the Genesee River.

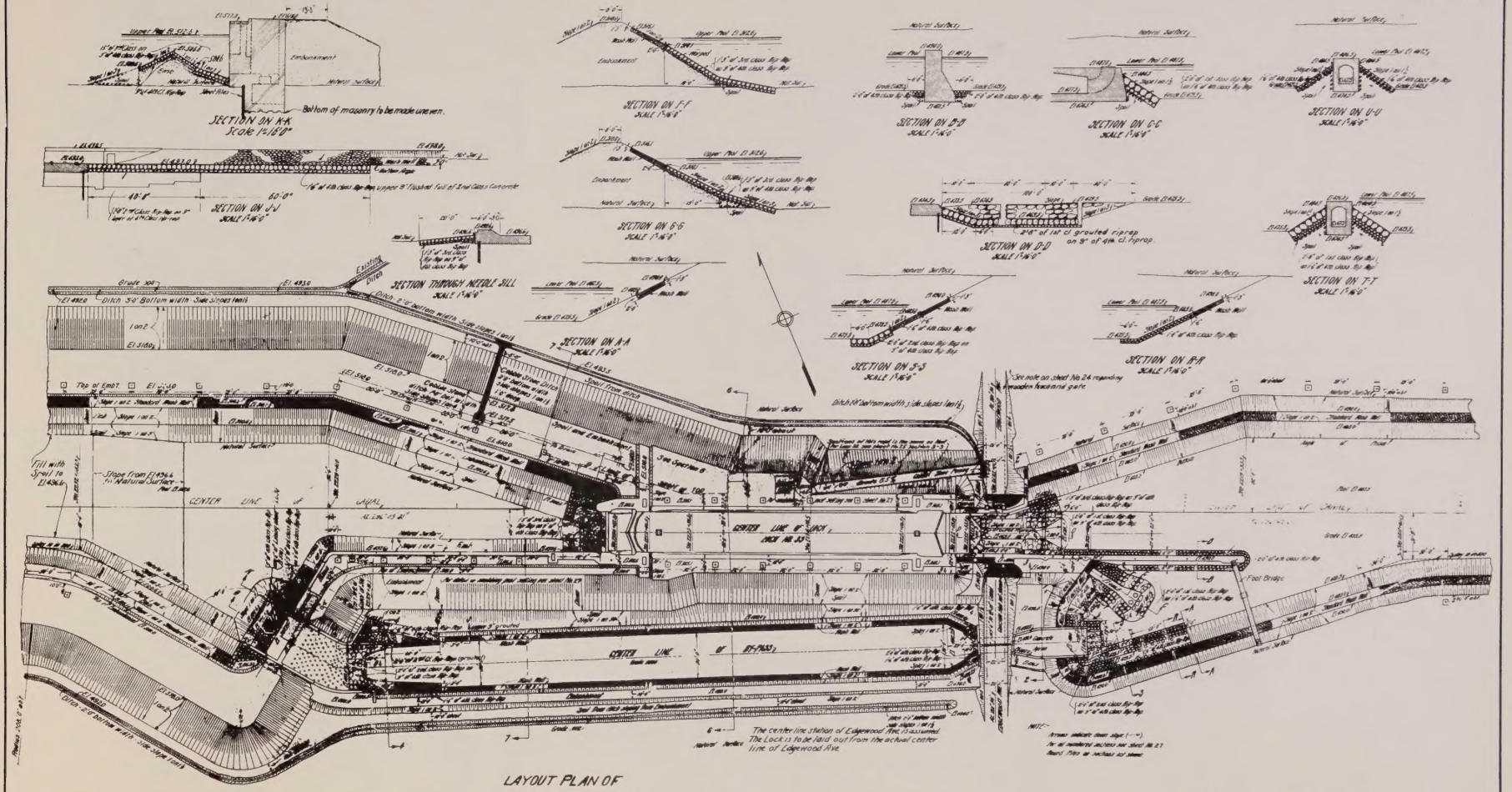
UPPER GUIDE WALL & UPPER SPILLWAY

LOCK 33

Scales as indicated.

Examined and approved

Special Deputy State Engineer



LAYOUT PLAN OF
LOCK 33 AND VICINITY.
Scale 1"=50'

Contract No. 23.

Erie Canal — Section 9.

From Kings Bend to the Genesee River.

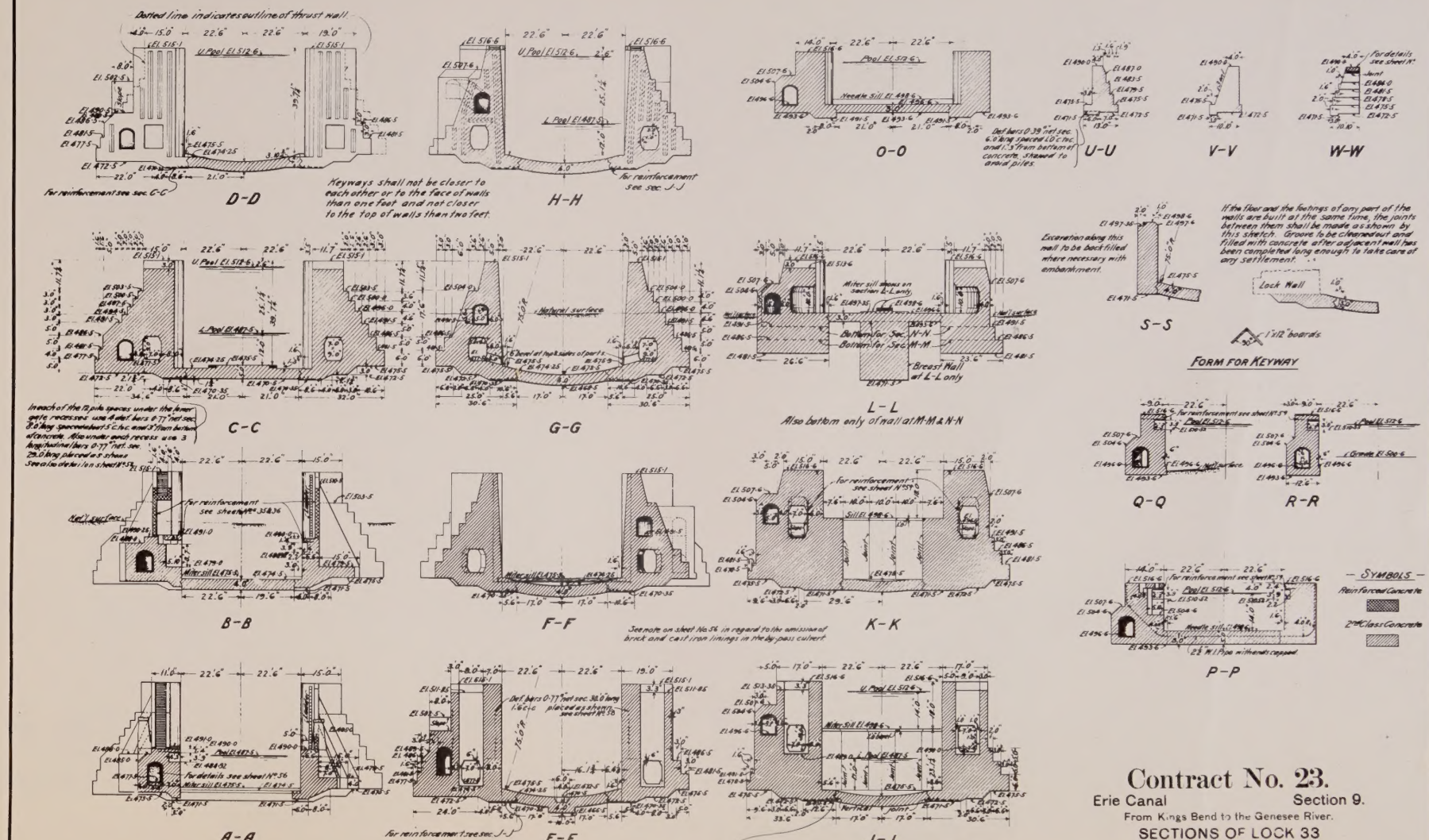
LAYOUT PLAN & SECTIONS OF LOCK 33
& VICINITY SHOWING PROTECTION WORK

Scales as indicated.

Examined and approved
Wm. B. Landreth
Superintendent

MADE BY J.C. Rogers
TRACED BY A. Anderson, May 1911
1st CHECK BY J.C.R. John. 30, 1912
2nd CHECK BY Landreth Feb. 2, 1912

26



MADE BY O.F.B. Olson 2-08
TRACED BY J.R. Lang 1-3-08
1ST CHECK BY [illegible] 4/08
2ND CHECK BY [illegible] 4/8

Contract No. 23.

Erie Canal Section 9.

From Kings Bend to the Genesee River.

SECTIONS OF LOCK 33

Scale: 16 feet to the inch.

Approved and approved

[illegible]
Special Deputy State Engineer

190

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LRI